27612

NATIONAL LIBRARY
OTTAWA

CANADA

BIBLIOTHÈQUE NATIONALE
OTTAWA

NAME OF AUTHOR............JOSEPH BELICEK

TITLE OF THESIS...........COCCINELLIDAE OF WESTERN CANADA
AND ALASKA

UNIVERSITY..

DEGREE FOR WHICH THESIS WAS PRESENTED.....Master of Science

YEAR THIS DEGREE GRANTED..................................

Permission is hereby granted to THE NATIONAL LIBRARY OF CANADA to microfilm this thesis and to lend or sell copies of the film.

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

(Signed)..................

PERMANENT ADDRESS:

Department of Entomology
University of Alberta
Edmonton T6G 2E3

DATED........March 29th........1976

NL-91 (10-68)

INFORMATION TO USERS

THIS DISSERTATION HAS BEEN MICROFILMED EXACTLY AS RECEIVED

This copy was produced from a microfiche copy of the original document. The quality of the copy is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

PLEASE NOTE: Some pages may have indistinct print. Filmed as received.

Canadian Theses Division
Cataloguing Branch
National Library of Canada
Ottawa, Canada K1A 0N4

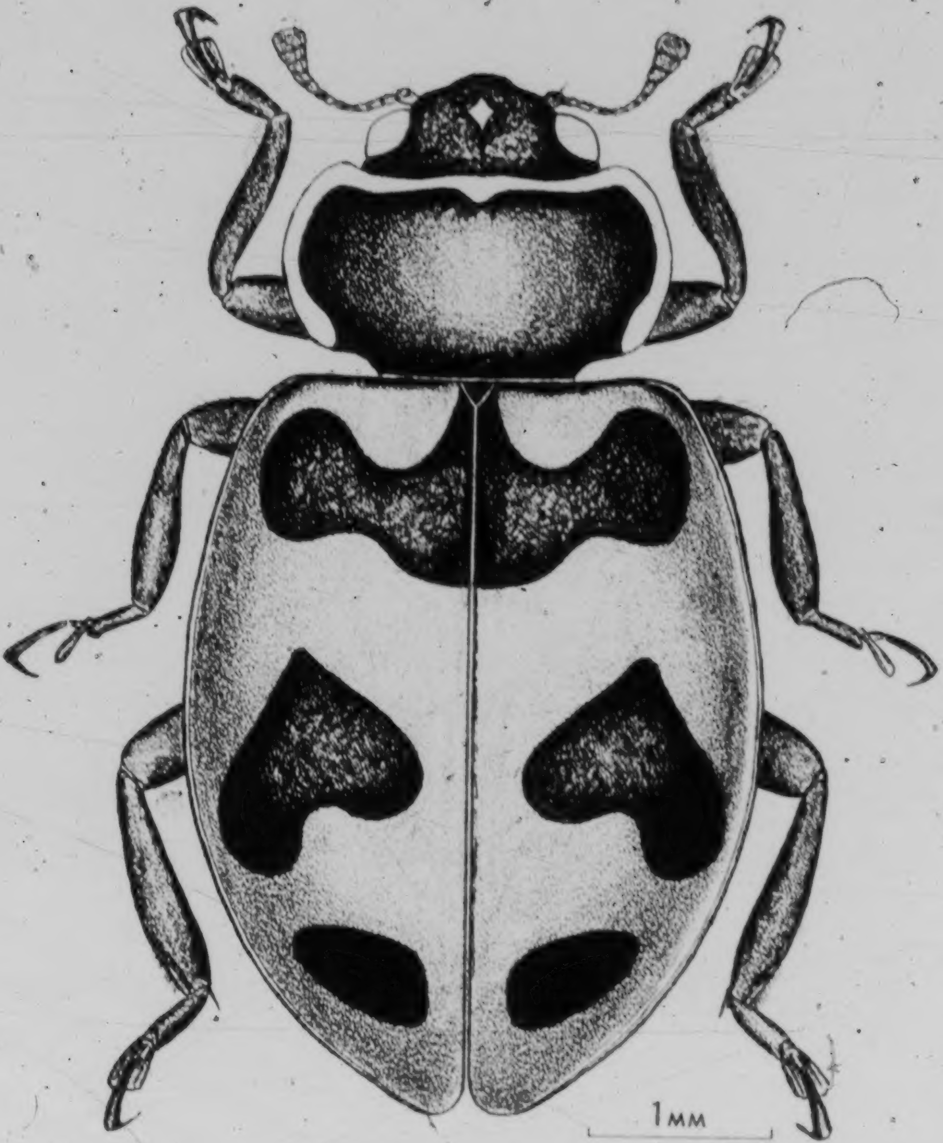
AVIS AUX USAGERS

LA THESE A ETE MICROFILMEE TELLE QUE NOUS L'AVONS RECUE

Cette copie a été faite à partir d'une microfiche du document original. La qualité de la copie dépend grandement de la qualité de la thèse soumise pour le microfimage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

NOTA BENE: La qualité d'impression de certaines pages peut laisser à désirer. Microfilmée telle que nous l'avons reçue.

Division des thèses canadiennes
Direction du catalogage
Bibliothèque nationale du Canada
Ottawa, Canada K1A 0N4



Frontispiece:

Habitus of *Hippodamia oregonensis* Crotch, an alpine member of Coccinellidae.

THE UNIVERSITY OF ALBERTA

COCCINELLIDAE OF WESTERN CANADA AND ALASKA WITH ANALYSES OF THE TRANSMONTANE ZOOGEOGRAPHIC RELATIONSHIPS BETWEEN THE FAUNA OF BRITISH COLUMBIA AND ALBERTA

(INSECTA: COLEOPTERA: COCCINELLIDAE)

by

©

JOSEPH BĚLÍČEK

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF SCIENCE

DEPARTMENT OF ENTOMOLOGY

EDMONTON, ALBERTA
SPRING, 1976

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled "Coccinellidae of western Canada and Alaska with analyses of the transmontane zoogeographic relationships between the fauna of British Columbia and Alberta (Insecta: Coleoptera: Coccinellidae)" submitted by Joseph Bělíček in partial fulfilment of the requirements for the degree of Master of Science.

G. E. Ball
....
Supervisor

....
D. A. Craig
....

Date Oct. 22 1975

DEDICATION

I dedicate this thesis to the late F. S. Carr, the J. L. Carr family of Calgary, whose extensive collections formed the nucleus of my study material, and to Wendy.

ABSTRACT

The coccinellid fauna of western Canada and Alaska is represented by 88 recorded species, currently classified in 25 genus-group taxa. Of these, nine species (10.2%) are shared with the Palaearctic Region, and five species (5.6%) are shared with Central America. The remaining 74 species are exclusively North American. Nine species are endemic to western Canada and Alaska.

Keys are provided for identification of adult specimens to species. Three species, Hyperaspis jasperensis, (type locality: ALBERTA, Jasper National Park, Bald Hills), Hyperaspidius hercules, (type locality: ALBERTA, Medicine Hat), and Anatis borealis, (type locality: ALBERTA, Edmonton) are described as new. Thirty two specific names are listed as synonyms for the first time. Provided for each species are: synonymic list, comparative characterization, description, discussion of variation, taxonomic notes, and notes on habitat. For some species figures of diagnostic structural characteristics are also given. Geographic distribution ranges are mapped for species reported from the study area. Of the 88 species recorded for western Canada and Alaska, 64 are recorded for Alberta and 75 for British Columbia, with 46 species common to both provinces. Sixteen species are confined to the west of the Continental Divide (Rocky Mountain Trench).

Five species are known only from grasslands of southeastern Alberta and Saskatchewan.

The possible origin and the composition of the western Canadian-Alaskan coccinellid fauna is re-examined on the basis of available geological evidence, especially the extent of Wisconsin glaciation in North America, and location of possible refugia. Approximately 85% of the present fauna is probably derived post-glacially from North America south of the southern limit of glaciation, 12% from the Rocky Mountains refugia, and 3% from the Beringian refugium.

The coccinellid beetles studied were collected in a variety of habitats including high altitude alpine, subalpine, boreal forest, arctic tundra, and semidesert, arid grasslands of southeastern Alberta. The transmontane zoogeography of the Alberta, British Columbia portion of the fauna is discussed in detail. Altitudinal distributions are also briefly commented upon in some instances. The Rocky Mountains are not an effective barrier to dispersal of coccinellids. The Rocky Mountains played a significant role in the development of the North American coccinellid fauna, mainly as a source of new habitats.

ACKNOWLEDGEMENTS

The project was suggested to me by George E. Ball, who also acted as my supervisor. I am very much obliged for his guidance and constant encouragement during my studies at the University of Alberta. For reading and commenting upon the manuscript, I am grateful to the members of my thesis committee, in particular George E. Ball, and Douglas A. Craig of the University of Alberta. Their suggestions and criticism were much appreciated.

I am grateful to the late B. Hocking, Professor and Chairman of the Department, and all the other staff members for their interest in my work and for providing stimulating atmosphere during my stay at the Department.

W. A. Fuller from the Department of Zoology, University of Alberta, arranged accommodation and transport at the research station at Heart Lake, Northwest Territories; and T. Herman, E. McPhee, D. Musbach, G. Dyke, and D. Christiansen working at the station provided assistance. The accommodation in Yellowknife was provided by Douglas and Sheila Larsen, and in Inuvik I was a guest of R. Hill at the Arctic Research Laboratory. I thank them all for their kindness and hospitality.

Many individuals and institutions loaned or donated specimens on which this study is based. I am particularly indebted to those who made special efforts to secure

specimens for my work. The nucleus of my study material were collections of the late F. S. Carr (now in UASM), and the John L. Carr family at Calgary. David H. Kavanaugh collected specimens for me on Vancouver Island, Tom Herman at the Heart Lake research station (N.W.T.), and Douglas Larsen in Yellowknife. I heartily thank curators, listed in section 2.1 Materials, for the loan of specimens from collections in their care. A. Smetana, E. C. Becker, J. M. Campbell, D. M. Wood of Ottawa, R. E. Leech of Edmonton, and R. D. Gordon, D. R. Whitehead and T. L. Erwin of Washington, D. C., were courteous and helpful hosts during my visit at the Biosystematics Research Institute and the United States National Museum, respectively. The Homoptera prey species were identified by W. R. Richards of the Biosystematics Research Institute, Ottawa.

This study was financed through National Research Council of Canada Grant No. A 1399, held by G. E. Ball, and The University of Alberta, Boreal Institute grants-in-aid awarded to me in 1971 and 1972.

I thank Wendy E. Parris for her understanding, patience with me, and moral support provided during the time I worked on this project. Robin E. Leech offered many valuable suggestions in the discussions I had with him about systematics; Henry E. Frania, Donald R. Whitehead, Battista P. Chiolino, Henri Goulet, Andrew P. Nimmo contributed to discussions about Coleoptera in general. I

thank John S. Scott of the Department of Entomology for generous help with graphics and drafting, and George D. Braybrook for scanning electron microscopy.

I acknowledge with gratitude the services and assistance of the Computing Services, University of Alberta during production of this thesis. I thank Operations manager Henry F. Ewasechko for his, beyond the call of duty, assistance in computing matters. The text was printed on the IBM 360/67 using the program NEW:FMT.

TABLE OF CONTENTS

FRONTISPIECE *Hippodamia oregonensis* Crotch ii
DEDICATION v
ABSTRACT vi
ACKNOWLEDGEMENTS viii
TABLE OF CONTENTS xi
LIST OF PLATES xvii
LIST OF FIGURES xvii
LIST OF TABLES xxv
1.0 INTRODUCTION 1

2.0 MATERIALS AND METHODS

2.1 Materials 7
2.2 Methods and techniques 10
2.3 Illustrations 12
2.4 Criteria for species-group and genus-group taxa. 13
2.5 Taxonomic literature 15

3.0 CLASSIFICATION

3.1 Family Coccinellidae 16
3.2 Revised generic classification of North American Coccinellidae 26
3.3 Key to the coccinellid tribes of Canada and Alaska, and key to genera of western Canada and Alaska .. 32
3.4 Genus *Microweisea* Cockerell 38
3.4.0 Key to species 40
3.4.1 *M. marginata* (LeConte) 40
3.4.2 *M. misella* (LeConte) 41
3.5 Genus *Stethorus* Weise 42
3.5.0 Key to species 44

TABLE OF CONTENTS

  - 3.5.1 *S. picipes* Casey 45
  - 3.5.2 *S. punctillum* Weise 47
- 3.6 Genus *Didion* Casey 48
  - 3.6.0 Key to species 49
  - 3.6.1 *D. longulum* Casey 49
  - 3.6.2 *D. nanus* (LeConte) 50
  - 3.6.3 *D. punctatum* (Melsheimer) 51
- 3.7 Genus *Scymnus* Kugelann (*sensu stricto*) 52
  - 3.7.0 Key to species 54
  - 3.7.1 *S*. (*S*.). *apicanus* Chapin 55
  - 3.7.2 *S*. (*S*.). *paracanus* Chapin 56
  - 3.7.3 *S*. (*S*.). *opaculus* Horn 59
  - 3.7.4 *S*. (*S*.). *phelpsi* Crotch 60
  - 3.7.5 *S*. (*S*.). *caurinus* Horn 61
- 3.8 Subgenus *Pullus* Mulsant 62
  - 3.8.0 Key to species 62
  - 3.8.1 *S*. (*P*.). *postpinctus* Casey 64
  - 3.8.2 *S*. (*P*.). *marginicollis* Mannerheim 65
  - 3.8.3 *S*. (*P*.). *carri* Gordon 66
  - 3.8.4 *S*. (*P*.). *aquilonarius* Gordon 67
  - 3.8.5 *S*. (*P*.). *lacustris* LeConte 67
  - 3.8.6 *S*. (*P*.). *coniferarum* Crotch 68
  - 3.8.7 *S*. (*P*.). *ardelio* Horn 69
  - 3.8.8 *S*. (*P*.). *calaveras* Casey 71
- 3.9 Genus *Nephus* Mulsant 72
  - 3.9.0 Key to species 73
  - 3.9.1 *N. ornatus* LeConte 74

TABLE OF CONTENTS

3.9.2 *N. georgei* (Weise) 75
3.9.3 *N. sordidus* Horn 76
3.10 Genus *Hyperaspidius* Crotch 77
3.10.0 Key to species 78
3.10.1 *H. hercules*, new species 79
3.10.2 *H. vittigerus* (LeConte) 81
3.10.3 *H. arcuatus* (LeConte) 82
3.11 Genus *Hyperaspis* Dejean 83
3.11.0 Key to species 86
3.11.1 *H. lateralis* Mulsant 89
3.11.2 *H. fastidiosa* Casey 91
3.11.3 *H. postica* LeConte 93
3.11.4 *H. fimbriolata* Melsheimer 94
3.11.5 *H. quadrivittata* LeConte 96
3.11.6 *H. elliptica* Casey 97
3.11.7 *H. undulata* (Say) 98
3.11.8 *H. oregona* Dobzhansky 100
3.11.9 *H. lanei* Hatch 101
3.11.10 *H. dissoluta* Crotch 102
3.11.11 *H. simulatrix* Dobzhansky 104
3.11.12 *H. lugubris* (Randall) 105
3.11.13 *H. jasperensis*, new species 107
3.12 Genus *Brachiacantha* Dejean 108
3.12.1 *B. ursina* (Fabricius) 111
3.13 Genus *Chilocorus* Leach 113
3.13.0 Key to species 115
3.13.1 *C. stigma* (Say) 116

TABLE OF CONTENTS

3.13.2 *C. tricyclus* Smith 117
3.13.3 *C. hexacyclus* Smith 118
3.14 Genus *Exochomus* Redtenbacher 119
3.14.1 *E. aethiops* (Bland) 120
3.15 Genus *Brumoides* Chapin 121
3.15.1 *B. septentrionis* (Weise) 122
3.16 Genus *Coccidula* Kugelann 124
3.16.1 *C. occidentalis* Horn 125
3.17 Genus *Anatis* Mulsant 127
3.17.0 Key to species 128
3.17.1 *A. lecontei* Casey 130
3.17.2 *A. rathvoni* (LeConte) 131
3.17.3 *A. borealis*, new species 132
3.18 Genus *Myzia* Mulsant 135
3.18.0 Key to species 138
3.18.1 *M. subvittata* (Mulsant) 138
3.18.2 *M. pullata* (Say) 139
3.18.3 *M. horni* Crotch 142
3.19 Genus *Calvia* Mulsant 143
3.19.1 *C. quatuordecimguttata* (Linnaeus) 144
3.20 Genus *Adalia* Mulsant 148
3.20.1 *A. bipunctata* (Linnaeus) 149
3.21 Genus *Olla* Casey 152
3.21.1 *O. v-nigrum* (Mulsant) 153
3.22 Genus *Cycloneda* Crotch 156
3.22.1 *C. polita* Casey 157
3.23 Genus *Coccinella* Linnaeus 159

TABLE OF CONTENTS

3.23.0 Key to species 162

3.23.1 *C. alta* Brown 163

3.23.2 *C. monticola* Mulsant 165

3.23.3 *C. transversoguttata* Falderman 169

3.23.4 *C. hieroglyphica* Linnaeus 171

3.23.5 *C. novemnotata* Herbst 173

3.23.6 *C. fulgida* Watson 175

3.23.7 *C. undecimpunctata* Linnaeus 177

3.23.8 *C. californica* Mannerheim 178

3.23.9 *C. trifasciata* Linnaeus 180

3.23.10 *C. prolongata* Crotch 183

3.24 Genus *Hippodamia* Dejean 186

3.24.0 Key to species 190

3.24.1 *H. arctica* Schneider 195

3.24.2 *H. americana* Crotch 196

2.24.3 *H. caseyi* Johnson 197

3.24.4 *H. convergens* Guérin-Méneville 199

3.24.5 *H. apicalis* Casey 201

3.24.6 *H. falcigera* Crotch 204

3.24.7 *H. glacialis* (Fabricius) 206

3.24.8 *H. moesta* LeConte 208

3.24.9 *H. oregonensis* Crotch 209

3.24.10 *H. parenthesis* (Say) 212

3.24.11 *H. lunatomaculata* Motschulsky 213

3.24.12 *H. quinquesignata* (Kirby) 215

3.24.13 *H. sinuata* Mulsant 217

3.24.14 *H. tredecimpunctata* (Linnaeus) 219

TABLE OF CONTENTS

3.24.15 *H. washingtoni* Timberlake 220

3.24.16 *H. ulkei* (Crotch) 222

3.25 Genus *Macronaemia* Casey 223

3.25.1 *M. episcopalis* (Kirby) 224

3.26 Genus *Mulsantina* Weise 225

3.28.0 Key to species 227

3.28.1 *M. picta* (Randall) 227

3.28.2 *M. hudsonica* (Casey) 229

3.27 Genus *Anisosticta* Dejean 231

3.27.0 Key to species 232

3.27.1 *A. bitriangularis* (Say) 232

3.27.2 *A. borealis* Timberlake 234

3.28 Genus *Psyllobora* Dejean 235

3.28.0 Key to species 236

3.28.1 *P. vigintimaculata* (Say) 237

3.28.2 *P. borealis* Casey 238

4.0 ZOOGEOGRAPHY

4.1 Introduction 240

4.2 Distribution patterns of Coccinellidae in western North America 240

4.3 Coccinellid fauna of western Canada and Alaska .242

4.3.1 Life zones 244

4.3.2 Source areas of post-glacial dispersal of Coccinellidae in western North America 248

4.4 Transmontane relationships between the fauna of British Columbia and Alberta 256

TABLE OF CONTENTS

4.4.1 Dispersal potential of coccinellids and vicariance 256
4.5 Conclusions 261
5.0 LITERATURE CITED 314
6.0 AUTOBIOGRAPHICAL NOTE 347
7.0 APPENDIX "A" (Locality data for specimens studied) .349

LIST OF PLATES

PLATE "A" - Diagram of male genital armature.............22

LIST OF FIGURES

Diagrams of habitus:

Fig. 1. *Microweisea marginata* (LeConte) 265
Fig. 1. *Microweisea misella* (LeConte) 265
Fig. 2. *Stethorus picipes* Casey 265
Fig. 3. *Didion longulum* Casey 265
Fig. 4. *Didion punctatum* (Melsheimer) 265
Fig. 5. *Scymnus* (*Scymnus*) *apicanus* Chapin 265
Fig. 5. *Scymnus* (*Scymnus*) *paracanus* Chapin 265
Fig. 6. *Scymnus* (*Pullus*) *postpinctus* Casey 265
Fig. 7. *Scymnus* (*Pullus*) *lacustris* LeConte 265
Fig. 7. *Scymnus* (*Pullus*) *calaveras* Casey 265
Fig. 8. *Nephus georgei* Weise 265
Fig. 9. *Nephus ornatus* LeConte 265
Fig. 10. *Scymnus* (*Pullus*) *coniferarum* Crotch 265
Fig. 11. *Scymnus* (*Pullus*) *ardelio* Horn 265
Fig. 12. *Hyperaspidius hercules*, new species 265
Fig. 12. *Hyperaspidius vittigerus* (LeConte) 265

LIST OF FIGURES

Fig. 13. *Hyperaspis fastidiosa* Casey 267

Fig. 14. *Hyperaspis fimbriolata* (Melsheimer) 267

Fig. 15. *Hyperaspis dissoluta* Crotch 267

Fig. 16. *Hyperaspidius arcuatus* (LeConte) 267

Fig. 17. *Hyperaspis lateralis* Mulsant 267

Fig. 18. *Hyperaspis lateralis* Mulsant 267

Fig. 19. *Hyperaspis simulatrix* Dobzhansky 267

Fig. 20. *Hyperaspis oregona* Dobzhansky 269

Fig. 21. *Hyperaspis annexa* LeConte 269

Fig. 22. *Hyperaspis quadrivittata* LeConte 269

Fig. 23. *Hyperaspis elliptica* Casey 269

Fig. 24. *Hyperaspis postica* LeConte 269

Fig. 25. *Hyperaspis undulata* (Say) 269

Fig. 26. *Hyperaspis lanei* Hatch 269

Fig. 27. *Hyperaspis simulatrix* Dobzhansky 269

Fig. 28. *Hyperaspis jasperensis*, new species 269

Fig. 29. *Hyperaspis lugubris* (Randall) 269

Fig. 30. *Hyperaspis levrati* Mulsant 269

Fig. 31. *Brachiacantha ursina* (Fabricius) 269

Fig. 32. *Exochomus aethiops* (Bland) 269

Fig. 33. *Chilocorus stigma* (Say) 269

Fig. 34. *Brumoides septentrionis* (Weise) 269

Fig. 35. *Coccidula occidentalis* Horn 269

Fig. 36. *Anatis borealis*, new species 271

Fig. 37. *Anatis lecontei* Casey 271

Fig. 38. *Anatis rathvoni* (LeConte) 271

LIST OF FIGURES

Fig. 39. *Myzia subvittata* (Mulsant) 271

Fig. 40. *Myzia horni* Crotch 271

Fig. 41. *Myzia pullata* (Say) 271

Fig. 42. *Calvia* (*A.*) *quatuordecimguttata* (Linnaeus) 271

Fig. 43. *Adalia bipunctata* (Linnaeus) 271

Fig. 44. *Olla v-nigrum* (Mulsant) 271

Fig. 45. *Cycloneda polita* Casey 271

Fig. 46. *Coccinella alta* Brown 252

Fig. 46. *Coccinella monticola* Mulsant 273

Fig. 47. *Coccinella novemnotata* Herbst 273

Fig. 48. *Coccinella undecimpunctata* Linnaeus 273

Fig. 49. *Coccinella prolongata* Crotch 273

Fig. 50. *Coccinella transversoguttata* Falderman 273

Fig. 51. *Coccinella californica* Mannerheim 273

Fig. 52. *Coccinella trifasciata* Linnaeus 273

Fig. 53. *Coccinella fulgida* Watson 273

Fig. 54. *Coccinella californica* Mannerheim 273

Fig. 55. *Hippodamia arctica* (Schneider) 273

Fig. 56. *Hippodamia americana* Crotch 273

Fig. 57. *Hippodamia ulkei* (Crotch) 273

Fig. 58. *Coccinella hieroglyphica* Linnaeus 273

Fig. 59. *Hippodamia falcigera* Crotch 273

Fig. 60. *Hippodamia caseyi* Johnson 273

Fig. 61. *Hippodamia convergens* Guérin-Méneville 273

Fig. 62. *Hippodamia apicalis* Casey 273

Fig. 63. *Hippodamia glacialis* (Fabricius) 275

LIST OF FIGURES

Fig. 64. *Hippodamia moesta* LeConte 275
Fig. 65. *Hippodamia oregonensis* Crotch 275
Fig. 66. *Hippodamia parenthesis* (Say) 275
Fig. 67. *Hippodamia quinquesignata* (Kirby) 275
Fig. 68. *Hippodamia sinuata* Mulsant 275
Fig. 69. *Hippodamia washingtoni* Timberlake 275
Fig. 70. *Hippodamia tredecimpunctata* (Linnaeus) 275
Fig. 71, 75. *Anisosticta bitriangularis* (Say) 275
Fig. 72. *Mulsantina hudsonica* (Casey) 275
Fig. 73. *Mulsantina picta* (Randall) 275
Fig. 74. *Macronaemia episcopalis* (Kirby) 275
Fig. 76. *Anisosticta borealis* Timberlake 275
Fig. 77. *Psyllobora vigintimaculata* (Say) 275
Fig. 78. *Psyllobora borealis* Casey 275

Pronotal microsculpture:

Fig. 79. *Coccinella transversoguttata* Mulsant 276
Fig. 80. *Calvia* (*Calvia*) *decemguttata* (Linnaeus) 276
Fig. 81. *Calvia* (*A.*) *quatuordecimguttata* (Linnaeus) 276
Fig. 82. *Adalia bipunctata* (Linnaeus) 276
Fig. 83. *Hippodamia tredecimpunctata* (Linnaeus) 276
Fig. 84. *Hyperaspis lateralis* Mulsant 276
Fig. 85. *Adalia bipunctata* (Linnaeus) 276
Fig. 86. *Olla v-nigrum* (Mulsant) 276

Elytral microsculpture:

Fig. 87. *Hyperaspis lateralis* Mulsant 276

Nearctic distributions:

LIST OF FIGURES

Fig. 88. *Microweisea misella* (LeConte) 278

Fig. 89. *Didion longulum* Casey 278

Fig. 89. *Didion punctatum* (Melsheimer) 278

Fig. 90. *Stehorus punctillum* Weise 278

Fig. 90. *Stethorus picipes* Casey 278

Fig. 91. *Scymnus* (*Scymnus*) *phelpsi* Crotch 278

Fig. 92. *Scymnus* (*Scymnus*) *apicanus* Chapin 278

Fig. 93. *Scymnus* (*Scymnus*) *paracanus* Chapin 278

Fig. 94. *Scymnus* (*Scymnus*) *opaculus* Horn 278

Fig. 95. *Scymnus* (*Pullus*) *postpinctus* 280

Fig. 96. *Scymnus* (*Pullus*) *aquilonarius* Gordon 280

Fig. 96. *Scymnus* (*Pullus*) *carri* Gordon 280

Fig. 97. *Scymnus* (*Pullus*) *ardelio* Horn 280

Fig. 98. *Scymnus* (*Pullus*) *coniferarum* Crotch 280

Fig. 99. *Scymnus* (*Pullus*) *lacustris* LeConte 280

Fig. 100. *Scymnus* (*Pullus*) *marginicollis* Mannerheim 280

Fig. 101. *Scymnus* (*Pullus*) *calaveras* Casey 280

Fig. 102. *Nephus georgei* Weise 282

Fig. 103. *Hyperaspidius arcuatus* (LeConte) 282

Fig. 104. *Hyperaspidius hercules*, new species 282

Fig. 105. *Nephus ornatus* LeConte 282

Fig. 106. *Nephus sordidus* Horn 282

Fig. 107. *Hyperaspidius vittigerus* (LeConte) 282

Fig. 108. *Hyperaspis lateralis* Mulsant 284

Fig. 109. *Hyperaspis fastidiosa* Casey 284

Fig. 110. *Hyperaspis postica* LeConte 284

LIST OF FIGURES

Fig. 111. *Hyperaspis elliptica* Casey 284
Fig. 112. *Hyperaspis fimbriolata* (Melsheimer) 284
Fig. 113. *Hyperaspis quadrivittata* LeConte 284
Fig. 114. *Hyperaspis undulata* (Say) 284
Fig. 115. *Hyperaspis oregona* Dobzhansky 286
Fig. 116. *Hyperaspis simulatrix* Dobzhansky 286
Fig. 117. *Hyperaspis lanei* Hatch 286
Fig. 118. *Hyperaspis dissoluta* Crotch 286
Fig. 119. *Hyperaspis lugubris* (Randall) 286
Fig. 120. *Brachiacantha ursina* (Fabricius) 286
Fig. 121. *Exochomus aethiops* (Bland) 288
Fig. 122. *Chilocorus tricyclus* Smith 288
Fig. 123. *Chilocorus hexacyclus* Smith 288
Fig. 124. *Chilocorus stigma* (Say) 288
Fig. 125. *Brumoides septentrionis* (Weise) 288
Fig. 126. *Coccidula occidentalis* Horn 288
Fig. 127. *Anatis lecontei* Casey 290
Fig. 128. *Anatis borealis*, new species 290
Fig. 129. *Anatis rathvoni* (LeConte) 290
Fig. 130. *Myzia subvittata* (Mulsant) 290
Fig. 131. *Myzia horni* Crotch 290
Fig. 132. *Myzia pullata* (Say) 290
Fig. 133. *Calvia quatuordecimguttata* (Linnaeus) 290
Fig. 134. *Adalia bipunctata* (Linnaeus) 290
Fig. 135. *Olla v-nigrum* (Mulsant) 292
Fig. 136. *Cycloneda polita* Casey 292

LIST OF FIGURES

Fig. 137. *Coccinella alta* Brown 292

Fig. 138. *Coccinella monticola* Mulsant 292

Fig. 139. *Coccinella transversoguttata* Mulsant 292

Fig. 140. *Coccinella hieroglyphica* Linnaeus 292

Fig. 141. *Coccinella novemnotata* Herbst 294

Fig. 142. *Coccinella californica* Mannerheim 294

Fig. 143. *Coccinella prolongata* Crotch 294

Fig. 144. *Coccinella fulgida* Watson 294

Fig. 144. *Coccinella undecimpunctata* Linnaeus 294

Fig. 145. *Coccinella trifasciata* Linnaeus 294

Fig. 146. *Hippodamia ulkei* (Crotch) 294

Fig. 147. *Hippodamia arctica* (Schneider) 294

Fig. 148. *Hippodamia americana* Crotch 296

Fig. 149. *Hippodamia caseyi* Johnson 296

Fig. 150. *Hippodamia apicalis* Casey 296

Fig. 151. *Hippodamia moesta* LeConte 296

Fig. 152. *Hippodamia convergens* Guérin-Méneville 296

Fig. 153. *Hippodamia falcigera* Crotch 296

Fig. 154. *Hippodamia oregonensis* Crotch 296

Fig. 155. *Hippodamia glacialis* (Fabricius) 296

Fig. 156. *Hippodamia parenthesis* (Say) 298

Fig. 157. *Hippodamia quinquesignata* (Kirby) 298

Fig. 158. *Hippodamia sinuata* Mulsant 298

Fig. 159. *Hippodamia washingtoni* Timberlake 298

Fig. 160. *Macronaemia episcopalis* (Kirby) 298

Fig. 161. *Hippodamia tredecimpunctata* (Linnaeus) 298

LIST OF FIGURES

Fig. 162. *Mulsantina picta* (Randall) 300

Fig. 163. *Mulsantina hudsonica* (Casey) 300

Fig. 164. *Anisosticta bitriangularis* (Say) 300

Fig. 165. *Anisosticta borealis* Timberlake 300

Fig. 166. *Psyllobora vigintimaculata* (Say) 300

Fig. 167. *Psyllobora borealis* Casey 300

Fig. 168. Maximum extent of Wisconsin glaciation (ca. 17-18,000 years BP), and source areas of post-glacial dispersal of Coccinellidae 302

Fig. 169. Life zones of North America 303

Fig. 170. *Hyperaspidius hercules*, new species; 170A.- spermatheca; 170B.- median lobe; 170C.-tegmen (lateral aspect; 170D.-basal lobe (dorsal aspect) 305

Fig. 171. *Hyperaspis jasperensis*, new species; 171A.-tegmen (lateral aspect); 171B.- median lobe (lateral aspect); 171C.- basal lobe (dorsal aspect); 171D.- spermatheca. 305

Fig. 172. *Anatis borealis*, new species; 172A.- median lobe (lateral aspect); 172B.- tegmen (lateral aspect); 172C.- basal lobe (dorsal aspect); 172D.- spermatheca. 305

Fig. 173. Hind leg, retracted; *Hyperaspis annexa* LeConte 307

Fig. 174. Hind leg, epipleural fovea exposed; *Hyperaspis lateralis* Mulsant 307

LIST OF FIGURES

Fig. 175. Antenna, Hyperaspidius insignis Casey 307

Fig. 176. Front leg, Brachiacantha dentipes (F.) 307

Fig. 177. Antenna, Hyperaspis lateralis Mulsant 307

Fig. 178. Antenna, Hyperaspis annexa LeConte 307

Fig. 179. Metacoxal arc, right; Hyperaspidius insignis Casey 307

Fig. 180. Metacoxal arc, left; Hyperaspidius insignis Casey 307

Tarsal claws:

Fig. 181. Hyperaspis lateralis Mulsant 309

Fig. 182. Hyperaspidius insignis Casey 309

Fig. 183. Brachiacantha dentipes (Fabricius) 309

Fig. 184. Brachiacantha dentipes (Fabricius) 309

Fig. 185. Hyperaspis lateralis Mulsant 309

Fig. 186. Hyperaspis annexa LeConte 309

Fig. 187. Hyperaspis annexa LeConte 309

Fig. 188. Hyperaspis lateralis Mulsant 309

Fig. 189. Hind wing, Hippodamia oregonensis Crotch 311

Fig. 190. Tarsus, Hyperaspis jasperensis, n. sp. 311

Fig. 191. Labium, Hyperaspis jasperensis, n. sp. 311

Fig. 192. Antenna, Hippodamia oregonensis Crotch 311

Fig. 193. Dispersal routes through the Rocky Mountains .313

LIST OF TABLES

Table I. Source areas of post-glacial dipersal of Coccinellidae in western North America 251

Table II. Summary of a number of species of Coccinellidae within the life zones in western North America..255

1.0 INTRODUCTION

Purpose, nature and scope of this work.- The North American beetle fauna with estimated 28,600 species (Arnett, 1967) is one of the better known in the world. Comprehensive and detailed regional faunistic studies are logical continuations to further refine and increase this knowledge. The information presented in the following is a synthesis of a faunal-taxonomic study of one family of Coleoptera, the Coccinellidae, in western Canada and Alaska. A manual can now be provided for identification of species, based on external morphological features of adults, with emphasis on color pattern. However, dissection and comparison of male genital armature will be necessary in cases of species superficially indistinguishable on external characters.

Coccinellidae in general.- Coccinellid beetles are one of the better known groups of Coleoptera: primarily because of their popularity among naturalists for distinctive appearance, and their diurnal, non-secretive mode of life; secondarily, coccinellids received considerable attention as potential biological control organisms of some agricultural and forest pests. Faunistically, the group is best known from Europe, Japan, and eastern North America. The coccinellid faunas of Africa, Australia, Asia, and South America have been investigated only superficially. There has been little effort made, to integrate the widely scattered, and diverse information about coccinellids into the framework of a classification for the taxa described. Authors prior to 1900 did not understand how extensively color could vary within single species, so it is generally impossible to identify a described species without access to type material. Most color variants in polymorphic species were described as distinct species with resultant long synonymies and chaos in the nomenclature. I estimate that, at present, the world fauna is represented by more than 4,200 described species. This is approximately 75% of the total number of extant species.

North American Coccinellidae.- More than 400 described species of Coccinellidae comprise the North American fauna, with highest diversity in the southwestern part of the continent. Undoubtedly, additional species will be described, mainly in the genera Scymnus sensu latiore, and Hyperaspis Dejean. The family is in need of a revision on a continental basis, but more detailed knowledge is required for the southern elements of the Nearctic fauna and those of Middle America.

Major contributions to knowledge of North American Coccinellidae are papers by: Brown (1950, 1962, 1967); Brown and de Ruette (1962); Casey (1899, 1908, 1924); Chapin (1946, 1965a, 1965b); Crotch (1873, 1874a, 1874b); Dobzhansky (1931, 1935, 1941); Gordon (1970a, 1970b, 1970c, 1970d, 1970e, 1972, 1974a, 1974b, 1976); Horn (1895);

LeConte (1850, 1852, 1854, 1878, 1888); Leng (1903a, 1903b, 1908, 1911, 1920); Leng and Mutchler (1933); McKenzie (1936); Nunenmacher (1909, 1911, 1912a, 1912b, 1913, 1934a, 1934b, 1937, 1944, 1946, 1948); Say (1824, 1826, 1835); Stehr (1930); Timberlake (1911, 1943); Watson (1954, 1956); and Wingo (1952).

Coccinellid fauna of western Canada and Alaska.- A historical account of general insect collecting in northern Canada was given by Freeman (1958). Treatment of coccinellids of this fauna is limited to lists of taxa only. These are: Fall (1926), and Scott (1933) for Alaska; Leng (1919) for Northwest Territories; Brodie (1888); Carr (1920) for northern Alberta; Anonymous (1906), Clark (1948); Dobzhansky (1935), and Keen (1895) for parts of British Columbia. Hatch (1962) in his synopsis of species of beetles in the Pacific Northwest covered British Columbia. The primary objective of this study was first, to determine the composition of the western Candian-Alaskan coccinellid fauna, and to integrate this information into the framework of current classification of Coccinellidae. Secondly, analyses of the transmontane relationships between the coccinellid fauna of British Columbia and Alberta elucidate some problems connected with geographic isolation of species, refugia, vicariance and speciation.

The study area consisted of the American state of Alaska, the Canadian Yukon, Northwest Territories, provinces of Alberta and British Columbia. Almost a quarter of the North American continent in size, the study area is physiographically varied and complex. Three major physiographic regions occupy most of the area. These are: (1) Cordilleran region; (2) part of Interior Plains; and (3) part of the Canadian Shield. Munroe (1956) discussed in a general way Canada as an environment for insect life.

The North American Cordillera consists of two parallel mountain systems: the Rocky Mountain System on the east, and the Pacific Mountain System on the west. Between these two mountain systems is a series of Intermontane Plateaus. The collective term Northern Rockies includes the Canadian Rockies and parallel ranges of the Montana Rockies actually continuous with each other. The easternmost belt of the Northern Rockies is separated from the other Rocky Mountain ranges to the west in both the United States and in Canada by a pronounced depression known as the Rocky Mountain Trench, extending from Flathead Lake in Montana northward to the headwaters of the Yukon River. From a biogeographers' point of view, it is convenient to recognize this depression as a boundary between eastern and western distribution ranges for species where such division occurs. West of the Rocky Mountain Trench in British Columbia and the United States, is a succession of three overlapping mountain ranges. These are the Purcell, Selkirk and Columbia Ranges. Each range is truncated obliquely across its northern end by the Rocky Mountain Trench, suggesting that all three were formed prior to the eastern Rocky Mountains. The southern continuation of the three ranges is represented by the Bitterroot and associated smaller ranges in Montana. The Interior Plains extend into the study area only in the southeastern Alberta, and the Canadian Shield in northernmost Alberta and Northwest Territories.

Most parts of the Northern Rockies have been profoundly glaciated during Wisconsin time by local glaciers of alpine type (Flint, 1963; Wright & Frey, 1965). The Eastern Cordillera and Interior Plains located in Alberta and British Columbia have been extensively glaciated. Evidence indicates that Continental ice-sheet, originating in the northeast, has extended into the west central area of Alberta at least twice, whereas in the southern part of the Province the available evidence suggests at least five advances. During it's maximum extent, Continental ice reached the eastern flanks of the Canadian Rocky Mountains in the extreme southern part of the area, and in northeastern British Columbia, whereas in the intervening area the ice fell short of the mountain front by tens of miles. The Rocky Mountains supported ice throughout the Pleistocene with evidence of at least four advances, some of which extended well to the east from the mountain front, and in places and at varying times joined Continental ice-sheet. Although a well defined, absotute chronology is not available for the area, it is assumed that glacial deposits located on or near the surface are Wisconsinian in age. It may be that during the maximum extent of the "Classical Wisconsin" large tracks of the plains area of southern Alberta were not glaciated. Areas that appear not to have been glaciated include Cypress Hills, the higher peaks of the Rocky Mountains, and parts of the Foothils.

Further north, in the Yukon and Northwest Territories, the effects of glaciation are less well known. However, available evidence suggests two Continental ice advances that extended well into the mountain front to the west. Within the mountains, available evidence supports multiple glaciation. Wide areas between the western limits of eastern ice, and that which originated in the mountains, have not been, or at the most, affected only by a relatively early ice advance. Most of the western Yukon has never been glaciated during the Pleistocene (N. W. Rutter, Department of Geology, University of Alberta; Personal communication, 1975).

2.0 MATERIALS AND METHODS

2.1 Materials

During the course of this investigation 12,480 adults and more than 300 immatures of the North American Coccinellidae were studied, most (78%) of which were collected within the study area as defined earlier. Portions of summers (1972-73) were spent collecting in the Yukon, Northwest Territories, British Columbia and Alberta. The states of Washington, Idaho and Montana were also visited briefly to supplement the collections from the Canadian Rocky Mountains. Alaska was not visited.

About 90% of the specimens studied were loaned by museums and private collectors. The following abbreviations, as used in the text, identify these collections and curators in charge of them.

BNPC	Banff National Park Collection, Banff Museum, Banff, Alberta. J. Holroyd.
CAS	California Academy of Sciences, San Francisco, California 94118. H. B. Leech, D. H. Kavanaugh.
CDAL	Canada Department of Agriculture, Research Station Lethbridge, Alberta T1J 4B1. A. M. Harper.
CDAS	Canada Department of Agriculture, Research Station Summerland, British Columbia VOH 1Z0. R. D. McMullen.

CNC	Canadian National Collection of Insects, Biosystematics Research Institute, Ottawa, Ontario K1A OC6. E. C. Becker, R. de Ruette.
CUNY	Cornell University, Ithaca, New York 14850. H. Dietrich, L. L. Pechuman.
FMNH	Field Museum of Natural History, Chicago, Illinois 60605. H. Dybas.
HAHc	Henry and Anne Howden collection, Carleton University, Ottawa, Ontario. H. F. Howden.
IUB	Department of Zoology, Indiana University, Bloomington, Indiana 47401. F. N. Young.
JBel	Joseph Bělíček collection, Department of Entomology, University of Alberta, Edmonton, Alberta T6G 2E3. J. Bělíček.
JCarr	John L. and B. F. Carr collection, Calgary, Alberta T3A 1Y2. J. L. Carr.
MCZ	Museum of Comparative Zoology, Cambridge, Massachusetts 02138. J. F. Lawrence, J. C. Scott.
MSU	Department of Zoology and Entomology collection, Montana State University, Bozeman, Montana 59715. N. L. Anderson.
NFRC	Northern Forest Research Centre, Edmonton, Alberta T6H 3S5. H. R. Wong, J. C. E. Melvin.
PMRS	Provincial Museum of Natural History, Wascana Park, Regina, Saskatchewan S4S 0B3. R. R. Hooper.

UASM	University of Alberta, Strickland Museum collection, Department of Entomology, Edmonton, Alberta T6G 2E3. G. E. Ball.
UBC	University of British Columbia, Department of Zoology, Vancouver, British Columbia V6T 1W5. G. G. E. Scudder.
UCB	University of Colorado, Department of Entomology, Boulder, Colorado 80302. U. N. Lanham.
UCKC	University of Calgary Environmental Centre Kananaskis, Kananaskis, Alberta T2N 1N4. G. Pritchard.
UIM	University of Idaho, Department of Entomology, Moscow, Idaho 83843. W. F. Barr.
USNM	United States National Museum, Natural History, Washington, D. C. 20560. R. D. Gordon.
WSUP	Washington State University, Department of Entomology, Pullman, Washington 99163. W. J. Turner.
WWat	W. Y. Watson collection, Department of Biology, Wilfrid Laurier University, Waterloo, Ontario N2L 3C5. W. Y. Watson.
ZIUL	Zoological Institute, University of Lund, S-223 62 Lund, Sweden. C. H. Lindroth.

2.2 Methods and techniques

General.- Terms used in the text are explained where necessary. References to drawings, photo-micrographs and maps were made in appropriate places. All measurements are in millimeters unless stated otherwise. Descriptions of color and measurements are based on preserved specimens, and measurements are given as an interval without indication of sample size: e.g., Total Length (TL) 6.0-9.0mm; Width (W) 2.1-2.5 mm. The size of adults depends on conditions to which the larvae were exposed, e.g., climate, and/or abundance of prey, and because in this group the size was not used for statistical taxonomic comparisons, sample size is omitted.

Descriptions.- To minimize redundancy, only characteristics peculiar to a given lower ranking taxon are presented in its description. Characters common to all members of a given higher ranking taxon are in the description of that group.

Dissections.- Sclerotized parts of both male and female genital armature were routinely dissected and studied with the aid of a binocular microscope (Wild M5). Standard dissecting techniques were used. The extracted genital armature or parts of, were stored in small plastic vials partially filled with glycerine, and pinned through the cork, beneath the specimen.

Taxonomic methods.- Specimens were first sorted into groups based on external morphological similarity, especially size, maculation, and microsculpture. The groups thus established were further sorted by geographic locality, e.g., east or west of the Rocky Mountains. A survey of the male genital armature within each group refined the sorting further yet. To analyze color variation, I examined the male genital armature in at least 10 most extreme variants in groups where needed. After this preliminary sorting, most specimens could be assigned to species. Comparisons with type specimens were made where possible. Depository of type specimens is indicated where known. Most of the types of species described by J. L. LeConte and G. H. Horn are in the Museum of Comparative Zoology at Cambridge, Massachusetts. Other important collections containing type specimens are as follows: M. E. Mulsant and V. T. Motschulsky, University of Moscow, Soviet Union; J. F. W. Herbst and J. Weise, Museum fur Naturkunde, Berlin; G. R. Crotch, Cambridge University, England; C. Linnaeus, British Museum of Natural History, England; and J. C. Fabricius, Zoological Museum at Copenhagen, Denmark.

Subspecies were not recognized. Wilson and Brown (1953) pointed out the arbitrariness and difficulties in recognition and naming of subspecific taxa. In Coccinellidae many of the species exhibit pronounced geographic variation, particularly of color and pronotal and elytral maculation. Recognition of subspecies based on single character systems, i.e., elytral maculation, or male genital armature is not satisfactory. Independent character systems generally show independent geographic variation (Shull, 1945; 1946a). Thus I agree with the above authors that naming of subspecies generally conceals much variation.

2.3 Illustrations

Some of the diagrams of habitus and maculation (Figs. 1-78) were adapted and redrawn from Hatch (1962), or McKenzie (1936), and I here acknowledge their use. Descriptions are supplemented by line drawings of other structures where appropriate. The drawings were made with the aid of a camera lucida mounted on a Wild M5 stereoscopic microscope. Antennae, tarsal claws, microsculpture, were photographed with the aid of a scanning electron microscope (Cambridge, Stereoscan S4), some photomicrographs are reproduced as such, (Figs. 173-188) to show details which otherwise would be lost in line drawings. In some instances, figures were traced from photomicrographs (Figs. 190, 191).

Distribution maps based on records that I was able to confirm by examination of specimens are provided for species reported from the study area.

2.4 Criteria for species-group and genus-group taxa

Species are the basic units of evolution and classification (Ross, 1974), and I accept the classical definition of biological species as "groups of natural populations which are not reproductively isolated from each other but which are reproductively isolated from other such groups," (Mayr, 1969; Hull, 1970). But there is no single criterion of species. One or a few genetically distinct animals do not necessarily represent a species. There must be a natural, self-perpetuating population. Even populations with distinct genetic basis do not qualify as species until they have succesfully survived a considerable length of time. In speciation, survival is as significant as genetic potential (Hubbs, 1943). In Coccinellidae, most species are distinguishable on structural characters alone. Reproductive isolation is inferred for all species where it has not been demonstrated _per se_.

Criteria for genus-group taxa.- Classification is a system of ordered sets of objects (taxa) or abstractions (names, dendrograms) about them. The system used in biology is centered upon the species, considered to be the basic evolutionary units. Species are grouped into higher taxa in an hierarchic arrangement. Griffiths (1972) discussed in detail the different concepts and approaches used as how to group species into higher taxa, _i.e._, according to similarity, gap-size between next taxon, and cladistics. To prevent possible misunderstanding, I am concerned with phylogenetic (cladistic) classification, which is an adequate representation of relationships among extant taxa from the evolutionary standpoint in the Linnaean system of classification and nomenclature. Taxonomic work results in a hierarchic system of monophyletic groups (taxa). These groups are subordinate one to another and formal ranking of taxa is arbitrary. The only requirement is that the system consists only of monophyletic groups and that sister groups are coordinate and given the same rank. It is often stated (Blackwelder, 1967; Mayr, 1969) that it is difficult to define genus-group taxa objectively, and that these taxa are not equivalent in rank from group to group of animals. Such is indeed the case. Groups (taxa) are defined according to degree of their phylogenetic kinship (Hennig, 1950, 1966) by presence of synapomorphic characters. The difficulty lies in assigning formal rank to groups thus defined. For the present, the rank designation remains a compromise between convenience and stability of nomenclature on one hand, and consistency on the other. In the revised classification of Nearctic Coccinellidae (3.2), I follow Sasaji's (1968) arrangement proposed for suprageneric taxa, and modified the arrangement of genera within tribes from that used by Arnett (1968). This classification provides a general reference for arrangement of genus-group taxa in the systematic part.

2.5 Taxonomic literature

Only those published works directly pertinent to classification of North American Coccinellidae were cited. Generally excluded were references to works which did not propose any changes, either in concepts or nomenclature, e.g., faunal lists, catalogues. Since the International Commission for Zoological Nomenclature does not regulate the use of names for varieties or aberrations, such names, as published in the literature were generally disregarded and are omitted from synonymies listed here.

Note on validity of names published in Dejean's (1836) "Catalogue des coleopteres". According to the International Code of Zoological Nomenclature, Article 12, all names for the genus-group taxa published before 1931 are valid without description of the taxon, by indication (Article 16). This is the case for all generic names published by Dejean (1836), since all genera were indicated by species included. On the other hand, all species names published without previous description in this work are *nomina nuda*, and thus unavailable.

3.0 CLASSIFICATION

3.1 Family Coccinellidae

Coccinelle Olivier, 1808:991; Coccinellides Leach, 1815:1; Aphidiphagi Latreille, 1818:531; Aphidiphaga Kirby, 1837:228; Coccinoloidea Hope, 1840:28, 156; Aphidicola Motchulsky, 1845:332; Coccinelliens Blanchard, 1845:201; Securipalpes Mulsant, 1846:1; Coccinellidea Costa, 1849:1; Coccinellae LeConte, 1852:130; Pseudotrimera Emmons, 1854:136; Coccinelles Bouillon, 1858:1; Siphonophora Verhoeff, 1895:73; Pseudococcinellidae Weise, 1887:185; Cerasommatidiidae Brethes, 1925:199.

Diagnostic characterization

Adults.- Prominently convex to subhemispherical in shape. North American members, TL 0.8 - 12 mm. Few atypical representatives elongate-oval and oblong. Elytra entire, not striate or truncate, glabrous or pubescent. Elytra and pronotum maculate or not, maculation of distinct spots or bands. Tarsal formula 4-4-4, third article greatly reduced; or 3-3-3. Tarsal claws appendiculate, cleft or simple (Figs. 181-188). Antennae of 7 to 11 articles each, retracted beneath head at rest (Fig. 192).

Larvae.- Elongate, campodeiform. TL 2 - 18 mm. Head prognathous. Antennae of 1, 2, or generally 3 articles each. Mandibles sickle-shaped, enlarged at base, with retinaculum (except in Microweisea). Hypopharyngeal bridge well developed. Maxillary palpus of 3 articles, except in Noviini with 2 articles each. Labial palpus of 1 or 2 articles each. Ocelli three. Abdomen ten segmented, covered with setae and sclerotized plates with tubercles.

Major contributions to morphology and systematics of coccinellid larvae are papers by: Böving (1917); Emden (1949); Gage (1920); Kamiya (1964); Klausnitzer (1970); Savojskaja (1960, 1962, 1963, 1964a, 1964b); Savojskaja and Klausnitzer (1973); Strouhal (1927).

Pupae.- Obtect, without cocoons; in species of some genera, _e.g._, _Chilocorus_, _Epilachna_, pupae are partially enveloped by last larval skin. Attached to substrate by caudal end. Pupae of North American coccinellid species were discussed from the standpoint of structure, taxonomy and phylogenetic relationships by Phuoc and Stehr (1974).

Description

Beetles of minute to medium size (0.8- 18.0 mm). Body prominently convex to subhemispherical; members of some taxa elongate-oval, oblong. Color: varied, all colors of visible spectrum represented; members of several taxa concolorous or metallic; majority maculate on pronotum and elytra by distinct spots or bands. Vestiture: dorsal surface glabrous or pubescent, ventral surface and legs setose. Microsculpture: varied, from surface smooth (Fig. 81), to distinctly punctate (Fig. 84), or shagreened (isodiametric meshes well impressed, as in Figs. 79,80,82).

Head. Capsule, transverse quadrate, corners round. Compound eyes large, situated latero-anteriorly. Ocelli absent. Post-antennal process projected into eyes anteriorly, widely so in Epilachnini , Psylloborini and some Coccinellini; narrowly in Stethorini, Scymnini, Noviini, Scymnilini, Coccidulini, some Coccinellini, and Sticholotini. Surface of eyes finely faceted except in Coccidulini and Lithophilini.

Antennae. (Figs. 175, 177, 178, 192). Inserted in front of eyes, generally of 11 articles each, moderately long and clavate. Freely movable and retractile. Number of articles and/or length reduced in many groups.

Labrum. Transverse quadrate sclerite with rounded sides. Narrower than clypeus, except in Rodolia. Exposed or not.

Mandibles. Prominent in most members, acute at apex, bifid or not, most groups with basal tooth. In Sticholotini, without basal tooth and with simple apex. Epilachnini without basal tooth, with several denticles and large teeth on cutting edge.

Maxillae. Each of 4 articles. Apical article varied in shape in different groups, from triangular (securiform) to trapezoidal or slender and conical. Galea elongate, setigerous.

Labium. Of three parts; submentum, mentum and prementum. Labial palpus of 3 or 2 articles each (Fig. 191).

Thorax. Pronotum relatively large, convex. In some groups explanate anteriorly and/or laterally. Externally visible part of prosternum T-shaped, with broad intercoxal process and lateral wings in front of coxae. Prosternum of members of some species with distinct longitudinal carinae (prosternal carinae) on the surface of intercoxal process. Mesosternum short, with median posterior intercoxal process. Middle coxal cavities open. Surface of metasternum with arcuate femoral line, extended postero-laterally from middle coxal cavity.

Elytra. Convex to prominently convex, not truncate or striate. External margin reflexed, or explanate in some groups (Chilocorini) exceptionally. Epipleura with or without foveae for reception of hind femora.

Hind wings. (Fig. 189). Large and functional in most groups. Reduced and non-functional in species of some Euro-Asian genera, e.g., Stictobura, Lithophilus.

Legs. (Figs. 173, 174). Coxae normal type, non-variant. Trochanters, of normal type for Cucujoidea. Femora grooved. Tibiae, normal to variously modified, spinose and grooved (Fig. 176). Distal end of middle and hind tibiae with or without spurs. Tarsi with formula 4-4-4, or 3-3-3 in Stethorini, part of Scymnini, Noviini, Ortalini, Aspidimerini. Two tarsal claws, simple or variously modified, notched (Figs. 181-188).

Abdomen. With five or six visible sterna, the first visible sternum being the 3rd morphological one (III). Surface of sternum III sculptured with oblique lines (metacoxal arcs) projected postero-laterally (Figs. 179, 180).

Male genital armature. (Plate A, p.22). Structural components are homologous with those of other Coleoptera but modified to such an extent that their homologies are no longer obvious. These homologies were elucidated by Sharp & Muir (1912), Jeannel (1955), and the terms used are clarified in the following. Aedeagus: (Ae), composite structure of median lobe and tegmen together. Basal piece: (Bp), proximal part of tegmen. Basal lobe: (Bl), part of tegmen median to lateral lobes. Connective membrane: (Cm), tissue connecting tegmen and body wall. Internal sac: (Is), eversible membraneous sac at apex of median lobe. Lateral lobes: (Ll), paired processes of tegmen. Ejaculatory duct: (Ed), sperm duct. Median lobe: (Ml), tubular structure bearing intromittent sac at apex, through which sperm is discharged. Tegmen: (Te), composite structure; basal lobe + lateral lobes. Tegminal strut: (Ts), sclerite articulated with abdomen. Sipho: (Si), part of median lobe.

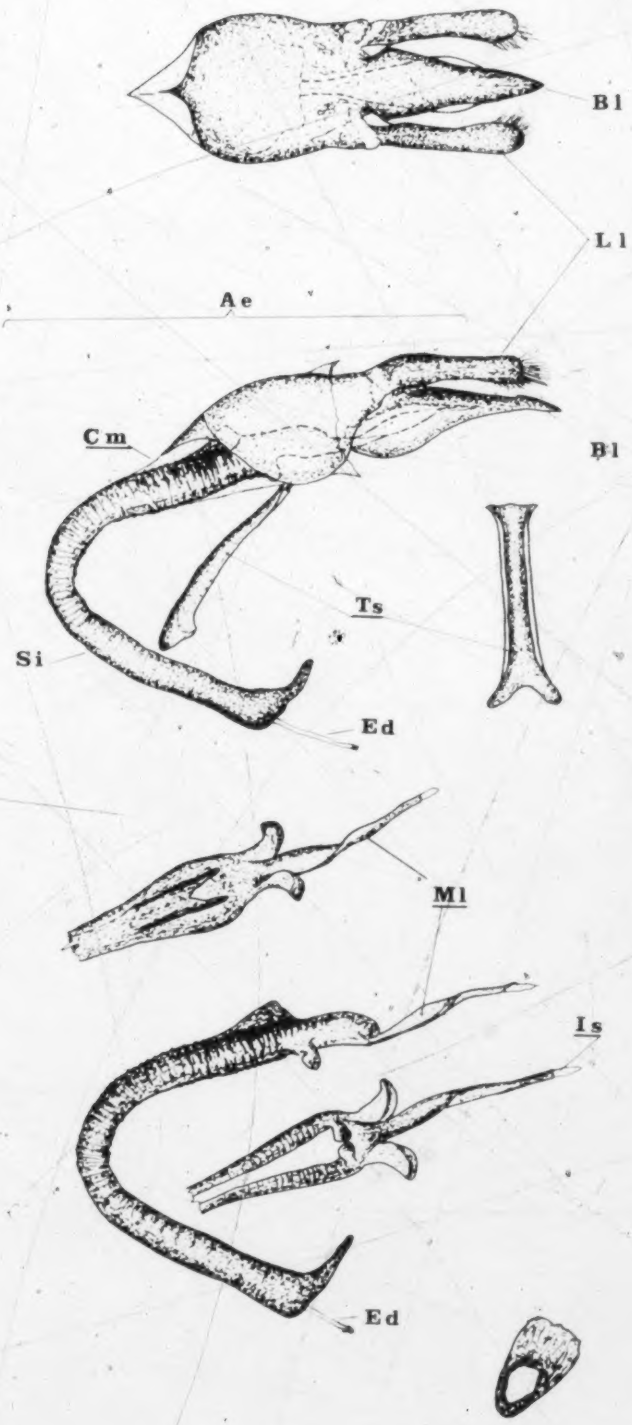
Plate "A"

Diagram of male genital armature

Ae.- Aedeagus
Bl.- Basal lobe
Bp.- Basal piece
Cm.- Connective membrane
Ed.- Ejaculatory duct
Is.- Internal sac
Ll.- Lateral lobes
Ml.- Median lobe
Te.- Tegmen
Ts.- Tegminal strut
Si.- Sipho

Hippodamia variegata (Goeze)

PLATE A


Bl
Ll
Ae
Cm
Bl
Ts
Si
Ed
Ml
Is
Ed

Natural history

This was reviewed in detail by Hagen (1962), Hodek (1967), and Hodek et al (1973). Balduf (1935), Clausen (1940) and Hodek (1966) covered aspects of this subject at some length.

Habitat.- The usual criterion for definition of a typical habitat is one in which a given species completes its life cycle (Hodek, 1973). In general, adults are little restricted to a particular site because of their great mobility and search for prey. Thus, a species whose adults are found almost everywhere, e.g., *Hippodamia tredecimpunctata*, is restricted to open fields for breeding. However, some species of some genera have become associated with ants, e.g., *Brachiacantha*, *Scymnus*, *Hyperaspis* (Wheeler, 1911). Most species recorded for western Canada and Alaska are predaceous (see below for food habits), and therefore their primary association is to their hosts. Habitats where I collected coccinellids range from arctic, subarctic tundra, alpine tundra, boreal forests of western North America, chaparral, sagebrush communities, to semidesert grasslands of southeastern Alberta.

Altitudinal distribution of Nearctic Coccinellidae.- In general, coccinellid beetles range from sea-level to the highest peaks of North American mountains (15,000 ft; 5,000 m). Most species are restricted to a particular habitat, which in most instances is defined by upper and lower elevation limits. Typical alpine taxa are _e.g._, _Hippodamia oregonensis_, _Coccinella alta_, _Hyperaspis jasperensis_, species which are restricted to and complete their life cycle in alpine zone of the Rocky Mountains. Since the vertical zonation of habitats is latitude dependent, _i.e._, alpine zone is at considerably higher elevations at southern latitudes, correspondingly the altitudinal distribution of coccinellids varies with latitude. Many species of Coccinellini form aggregations, notably near mountain peaks (reviewed by Hagen, 1965).

Mating.- The first copulation takes place a few days after emergence and is usually repeated several times during adult life. One copulation is in most cases sufficient to give the female lifetime fertility, but for those of some species _e.g._, _Stethorus_ which lack a spermatheca, repeated mating is a necessity (Putman, 1955a).

Adult longevity.- Individuals of species studied in this respect had a maximum life span corresponding to one season, or about one year. Exceptional records indicate possibility of a second hibernation, _e.g._, _Stethorus_ (Putman, 1955a), _Propylaea_ (El-Hariri, 1966).

Parasites and predators.- Larvae, pupae, and adult coccinellids are commonly parasitized by ichneumonid and chalcid wasps. Richerson (1970) provided a world list of parasites of Coccinellidae. Adults are eaten by birds and bears (hibernating aggregations). Cannibalism is the main hazard in rearing predaceous coccinellids.

Food habits.- This was reviewed by: Balduf (1935); Clausen (1940); Kamiya (1966); Hodek (1973); Sasaji (1967, 1971). Schilder & Schilder (1928) listed the prey species systematically. Predaceous coccinellids feed both as larvae and adults on a variety of homopterous insects: aphids, scale insects, psyllids; immature Coleoptera (Chrysomelidae); Acarina (Tetranychidae), and occasionally eat pollen and plant tissue. One group, Epilachninae are exclusively phytophagous on Cucurbitaceae, Solanaceae, and Leguminosae. Members of the tribe Psylloborini are specialized as fungivores, and feed on mildews of *Erisyphe*, *Sphaerotheca*, *Podosphaera* species (Davidson, 1921). Larvae in general feed on the same host species as adults, and in most instances the food preference is species-specific.

6

3.2 Revised generic classification of North American COCCINELLIDAE

Note: Taxa recorded from western Canada and Alaska are indicated by an asterisk (*).

SUBFAMILY STICHOLOTINAE (*)

Tribe Serangiini

Dephastus Casey, 1899:111.
    Lioscymnus Champion, 1913:125.

Tribe Sticholotini (*)

Microscymnus Champion, 1913:127.
Microweisea Cockerell, 1903:38. (*)
    Smilia Weise, 1891:288. Not Germar, 1838.
    Epismilia Cockerell, 1900:606. Not Fromental, 1861.
    Pseudoweisea Schwarz, 1904:118. Misquotation.
Nipus Casey, 1899:132,133.
Gnathoweisea Gordon, 1970:47.

SUBFAMILY SCYMNINAE (*)

Tribe Stethorini (*)

Stethorus Weise, 1885:65. (*)

Tribe Scymnini (*)

Scymnus Kugelann, 1794:545. (_sensu stricto_) (*)
    Pullus Mulsant, 1846:251. (*)
Nephus Mulsant, 1846:237. (*)

Turboscymnus Gordon, 1976: in press.

Scymnobius Casey, 1899:139.

Diomus Mulsant, 1850:951.

Cephaloscymnus Crotch, 1873:382.

Selvadius Casey, 1899:134,137.

Didion Casey, 1899:134,137. (*)

Blaisdelliana Gordon, 1970:43.

Tribe Hyperaspini(*)

Hyperaspis Dejean, 1835:459. (*)

Cleothera Mulsant, 1850:541.

Oxynychus LeConte, 1850:238.

Hyperaspidius Crotch, 1873:382. (*)

Brachiacantha Dejean, 1836:458. (*)

Brachyacantha Chevrolat, 1842:705. Unjustified emendation.

Thalassa Mulsant, 1850:506,511.

Helesius Casey, 1899:116,129.

Tribe Cryptognathini

Calloeneis Grote, 1873:143. Replacement name for Oeneis Mulsant.

Oeneis Mulsant, 1850:497,500. Not Huebner, 1819.

Delpastopsis Casey, 1924:170.

Dargo Chapin, 1955:87. Unnecessary replacement name for Oeneis Mulsant.

Tribe Scymnillini

Zagloba Casey, 1899:113.

Scymnillus Horn, 1895:110.

Scymnilloides Sicard, 1922:355.

SUBFAMILY CHILOCORINAE (*)

Tribe Chilocorini(*)

Axion Mulsant, 1850:477.

Chilocorus Leach, 1815:116. (*)

Chilochorus Hope, 1840:157. Misspelling.

Exochomus Redtenbacher, 1843:11. (*)

Arawana Leng, 1908:34,38.

Brumoides Chapin, 1965:237. (*)

Brumus: of authors. Not Mulsant, 1850.

Halmus Mulsant, 1850:471.

Orcus Mulsant, 1850:467.

SUBFAMILY COCCIDULINAE (*)

Tribe Coccidulini(*)

Coccidula Kugelann, 1798:421. (*)

Cacidula Curtis, 1826:184. Misspelling.

Cacicula Stephens, 1828:319. Misspelling.

Strongylus Panzer, 1813:114.

Lindorus Casey, 1899:161,162.

Rhyzobius Stephens, 1831:396.

Rhizobius Stephens, 1831:373. Misspelling.

Tribe Exoplectrini

Exoplectra Dejean, 1836:461.

Vedalia Mulsant, 1850:901,905.

Tribe Noviini

Anovia Casey, 1908:408.

Rodolia Mulsant, 1850:280,902.

Novius Mulsant, 1850:942. Replacement name for Nomius Mulsant, 1846.

Nomius Mulsant, 1846:213. Not Laporte, 1835.

SUBFAMILY COCCINELLINAE(*)

Tribe Coccinellini (*)

Anatis Mulsant, 1846:133. (*)

Myzia Mulsant, 1846:277, (index). (*)

Mysia Mulsant, 1846:129. Not Lamarck, 1818.

Neomysia Casey, 1899:98. Junior synonym.

Paramysia Reitter, 1911:136,144. Junior synonym.

Calvia Mulsant, 1846:140. (*)

Anisocalvia Crotch, 1871:4. (*)

Propylaea Mulsant, 1846:147,152.

Adalia Mulsant, 1850:49. Replacement name for Idalia Mulsant. (*)

Idalia Mulsant, 1846:133. Not Huebner, 1819.

Olla Casey, 1899:84,93. (*)

Cycloneda Crotch, 1871:6. (*) Replacement name for Daulis Mulsant, 1850.

Daulis Mulsant, 1850:295. Not Erichson, 1842.

Tribe Coccinellini (*), continued

Coccinella Linnaeus, 1758:364. (*)

Spilota Billberg, 1820:61. Junior synonym.

Hippodamia Dejean, 1836:456. (*)

Hemisphaerica Hope, 1840:157. Junior synonym.

Adonia Mulsant, 1846:39. Junior synonym.

Ceratomegilla Crotch, 1873:365. (*)

Spiladelpha Semenov & Dobzhansky, 1923:99.

Coleomegilla Timberlake, 1920:139. Replacement name for Megilla Mulsant, 1850:24. Preoccupied.

Megilla Mulsant, 1850:24. Not Fabricius, 1804.

Ceratomagilla: Malkin, 1943:194. Misspelling.

Eriopis Mulsant, 1850:6.

Eriopsis: Timberlake, 1943:10. Misspelling.

Macronaemia Casey, 1899:76. (*)

Micronaemia Weise, 1905:218. Unjustified emendation.

Mulsantina Weise, 1906:34. (*) Replacement name.

Cleis Mulsant, 1850:132,135. Not Guerin-Meneville, 1831. Not Mulsant, 1850:162.

Pseudocleis Casey, 1908:406. Junior synonym.

Aphidecta Weise, 1899:375.

Bulaea Mulsant, 1850:36.

Naemia Mulsant, 1850:30. (*)

Neoharmonia Crotch, 1871:2.

Agrabia Casey, 1899:87. Junior synonym.

Neoharmonia Casey, 1899:90. Junior homonym.

Harmoniaspis Casey, 1908:404. Junior synonym.

Tribe Psylloborini (*)

Psyllobora Dejean, 1842:606. (*)

Phyllobora Chevrolat, 1844:43. Misspelling.

SUBFAMILY EPILACHNINAE

Tribe Epilachnini

Epilachna Dejean, 1836:460.

Tribe Madaini

Subcoccinella Huber, 1841:376.

3.3 Key to the coccinellid tribes of Canada and Alaska

1 (0) Dorsal surface glabrous or only with sparse hairs .2

1' Dorsal surface distinctly pubescent 6

2 (1) Clypeus prominently expanded laterally to emarginate eyes ....Chilocorini (V.)

2' Clypeus not prominently expanded laterally 3

3 (2') Body length 0.8-1.5 mm. Terminal article of maxillary palpus conical ....Sticholotini (I.)

3' Body length greater than 1.5 mm 4

4 (3') Body length max. 5.0 mm. Antenna (Fig. 178) much shorter than interocular distance ....Hyperaspini (IV.)

4' Body length 3.0-12.5 mm. Antenna (Fig. 192), longer than interocular distance, and distinctly clavate .5

5 (4') Clypeus with prominent, forward projections in front of eyes. Anterior margin of pronotum recessed above eyes (anterior pronotal angles prominent). Mandibles bifid at apex. Body length 3.0-12.5 mm...Coccinellini (VII.)

5' Anterior margin of clypeus straight, without forward lateral projections. Pronotum with anterior margin not distinctly recessed, sinuate only. Mandibles with multidentate apices. Body length max. 3.0 mm ....Psylloborini (VIII.)

6 (1') Body length min. 5.0 mm, prominently convex. Mandibles multidentate at apex ....Epilachnini (not recorded from the study area)

6' Body length 1.5-3.5 mm. Mandibles simple or bifid .7

7 (6') Body elongate, oblong. Front coxal cavities open posteriorly ....Coccidulini (VI.)

7' Body oval, convex. Front coxal cavities closed posteriorly 8

8 (7') Prosternum projected anteriorly to cover partially mouthparts ....Stethorini (II.)

8' Anterior margin of prosternum straight, not projected anteriorly ....Scymnini (III.)

B.

Key to the coccinellid genera of western Canada and Alaska

I. Tribe Sticholotini

1 Single genus only ....Microweisea Cockerell (3.4)

II. Tribe Stethorini

1 Single genus only ....Stethorus Weise (3.5)

III. Tribe Scymnini

1 (0) Metacoxal arcs incomplete, not curved anteriorly, parallel laterally to sternal margin. Prosternum

carinate. Tarsal formula 3-3-3. Antenna of 10 articles each. ....Nephus Mulsant (3.9)

1' Metacoxal arcs various, recurved anteriorly. Tarsal formula 4-4-4. 2

2 (1') Metacoxal arcs incomplete, semicircular. Ultimate article of maxillary palpus securiform, much wider than penultimate article. Antenna of 11 articles each. Pronotum with sides continuous in outline with elytra ....Scymnus (Scymnus) Kugelann (3.7)

2' Metacoxal arcs complete 3

3 (2') Ultimate article of maxillary palpus securiform ....Scymnus (Pullus) Mulsant (3.8)

3' Ultimate article of maxillary palpus slender, only slightly wider than penultimate article. Pronotum with sides markedly narrower than base of elytra .. ..Didion Casey (3.6)

IV. Tribe Hyperaspini

1 (0) Front legs with anterior margin of tibia spinose (Fig. 176) ....Brachiacantha Dejean (3.12)

1' Front legs with tibia normal, slender 2

2 (1') Anterior margin of mentum cordiform, epipleuron foveate for reception of hind femur Fig. 174 ....Hyperaspis Dejean (3.11)

2' Anterior margin of mentum straight, epipleuron not foveate ....*Hyperaspidius* Crotch (3.10)

V. Tribe Chilocorini

1 (0) Tarsal claws appendiculate 2
1' Tarsal claws simple ....*Brumoides* Chapin (3.15)
2 (1') Antenna of 10 articles each ....
.......................*Exochomus* Redtenbacher (3.14)
2' Antenna of 8 articles each ....
..........................*Chilocorus* Leach (3.13)

VI. Tribe Coccidulini

1 Single genus only ....*Coccidula* Kugelann (3.16)

VII. Tribe Coccinellini

1 (0) Distal end of middle and hind tibiae with single or paired spur 2
1' Distal end of middle and hind tibiae without spurs, tarsal claw appendiculate, each with subquadrate basal tooth ....
.............................*Mulsantina* Weise (3.26)
2 (1) Distal end of middle and hind tibiae with single spur only. Tarsal claws simple, swollen at base.....
...........................*Anisosticta* Dejean (3.27)
2' Distal end of middle and hind tibiae with paired, prominent spurs 3
3 (2') Tarsal claws appendiculate or cleft, bifid 4
3' Tarsal claws simple, swollen at base. Body markedly

elongate. ....Macronaemia Casey (3.25)

4 Pronotum shagreened, isodiametric meshes between punctures well developed (Figs. 79, 80) 5

4' Surface of pronotum shiny, polished, without isodiametric meshes between punctures (Fig. 81)............................... Calvia Mulsant (3.19)

5 (4) Femora extended beyond lateral margins of elytra. Tarsal claws cleft, bifid. 6

5' Femora not extended beyond lateral margins of elytra. Tarsal claws appendiculate, each with large subquadrate basal tooth. 7

6 (5) Elytra mostly orange-yellow, except in melanic specimens, maculate with black spots or vittae (Figs. 55-57, 59-70). Frons with diamond, or crown-like, interocular yellowish-white spot or band ....Hippodamia Dejean (3.24)

7 (5') Pronotum mostly black, anterior angles with yellowish-white, trapezoidal spots. Frons with two well separated yellowish-white, interocular spots, or band. ....Coccinella Linnaeus (3.23)

7' Pronotum variously maculate, not as above. 8

8 (7') Body large, prominently convex to subhemispherical (TL 6-12 mm). 9

8' Body medium size (TL 4-6 mm). 10

9 (8) Each tarsal claw with large, basal subquadrate tooth. Elytra not vittate, if maculate each elytron with black spots ....

.................................Anatis Mulsant (3.17)

9' Each tarsal claw cleft, bifid. Maculation of elytra vittate as in Figs. 39-41. ....

..................................Myzia Mulsant (3.20)

10(8') Elytra concolorous, orange-red, without black maculation. ....Cycloneda Crotch (3.22)

10' Pronotum mostly black, with two basal white spots (Fig. 43); or in melanic specimens with elytra and pronotum mostly black, anterior angles of pronotum and elytral maculation orange-yellow ....

.................................Adalia Mulsant (3.20)

VIII. Tribe Psylloborini

1 Single genus only ....Psyllobora Dejean (3.28)

3.4 Genus *Microweisea* Cockerell

Microweisea Cockerell, 1903:38. Replacement name for *Smilia* Weise, 1891:288. Not Mulsant, 1850:502. Type-species: *Smilia felschei* Weise, 1891:288; since Article 67(i) of the International Code of Zoological Nomenclature states that replacement names of the genus-group taxa must have the same type-species as the original one.

Smilia Weise, 1891:288. Not Germar, 1838. Preoccupied. Type-species: *Smilia felschei* Weise, 1891:288. (=*Pentilia ovalis* LeConte, 1878:400). Designated by Weise, 1891:288; through monotypy.

Epismilia Cockerell, 1900:606. Replacement name for *Smilia* Weise, 1891. Not Fromental, 1861. Preoccupied.

Pseudoweisea Schwarz, 1904:118. Misquotation, unnecessary replacement name for *Smilia* Weise.

Note on nomenclature.- Horn (1895) was the first to note that the North American species assigned to the genus *Pentilia* Mulsant by LeConte (1878) represented a distinct monophyletic group unrelated to the genus *Pentilia* Mulsant, and already described as a genus *Smilia* Weise (1891). Not knowing that *Smilia* was a preoccupied name, Horn did not propose a replacement name. Cockerell (1900) noted that the name *Smilia* was preoccupied and proposed *Epismilia* as a replacement name. Unfortunately, this name was also preoccupied, and to correct this situation, Cockerell

(1903) proposed a second replacement name Microweisea. The name Pseudoweisea is a misquotation and unnecessary replacement name by Schwarz (1904), when referring to the Cockerell's second replacement name. Korschefsky (1931), for reasons best known to him, recorded Microweisea as a junior synonym of Pentilia Mulsant.

Comparison.- Small size, largest not longer than 1.5 mm, and obliquely impressed line on front angles of pronotum (Fig. 1), distinguish members of this genus from other coccinellids recorded from the study area.

Description.- Sticholotini of minute size (1.0-1.5 mm). Body ovoid, prominently convex to subhemispherical. Color: dorsal surface brown to black; ventral surface and legs brown to black. Vestiture: dorsal surface with pubescence short, sparse and indistinct. Sculpture: head finely punctate, frons shagreened; pronotum distinctly punctate, isodiametric meshes well impressed in some species, and when viewed under microscope (50x) microsculpture distinctly reticulate; elytra distinctly punctate, punctures uneven. Head: labrum expanded laterally; antenna of 11 articles each, relatively short; maxillary palpus conical. Thorax: pronotum convex; margins with impressed line, obliquely at anterior angles (Fig. 1). Elytra: margins and suture narrowly beaded. Abdomen: metacoxal arcs absent. Legs: tarsal formula 4-4-4, claws appendiculate.

Distribution.- North America, genus with six species included.

Natural history.- Both larvae and adults are specialized as predators upon the armored scales (Diaspinae). In the Prairie Region, Sharma and Martel (1972) reported adults and larvae to feed on pine needle scale Phenacaspis pinifoliae (Fitch).

3.4.0 Key to species

1 (0) Pronotal microsculpture reticulate; elytra distinctly punctate, punctures large .... M. misella (LeConte) (4.1)

1' Pronotal microsculpture indistinct, surface polished. Elytra indistictly punctate, punctures fine ....M. marginata (LeConte) (4.2)

3.4.1 Microweisea marginata (LeConte)

Pentilia marginata LeConte, 1878:400. Type locality: "Marquette, Lake Superior." Type in MCZ, not studied.

Comparison.- Distinguished from M. misella by characters given in the above key.

Description.- Habitus and maculation as in Fig. 1. Body minute, ovoid in outline; prominently convex. Color: head castaneous brown; antenna and mouthparts light brownish-yellow; ventral surface and legs brown-black, pronotum and elytra castaneous brown. Sculpture: pronotal anterior angles with obliquely impressed line; dorsal surface shallowly punctate, shiny; isodiametric meshes between punctures shallow, punctures of elytra evenly spaced, shallow, indistinct.

Variation.- Size: TL 1.1-1.4 mm; W 0.7-0.8 mm.

Distribution.- Widely ranging in North America, not figured. Recorded from: Alberta, British Columbia, Idaho, Manitoba, Michigan, Montana, Ontario, Oregon, Saskatchewan, Quebec, and Washington.

Collecting and natural history notes.- Habitat: coniferous forest and parkland, arboricole on pines infested with Phenacaspis pinifoliae (Fitch). For list of localities within the study area see Appendix "A". Univoltine, overwinters as 3rd larval instar (Sharma and Martel, 1972).

Number of specimens examined.- 10.

3.4.2 Microweisea misella (LeConte)

Pentilia misella LeConte, 1878:400. Type locality: None specified. Type in MCZ, not studied.

Comparison.- Distinguished from M. marginata by characters given in the above key.

Description.- Habitus and maculation as in Fig. 1.

Body minute, ovoid in outline; prominently convex. Color: head brown-black; antennae and mouthparts brown; pronotum and elytra brown-black and shiny; ventral surface and legs brown-black. Sculpture: head punctate, elytra distinctly; pronotal microsculpture reticulate; anterior angles of pronotum with obliquely impressed line (Fig. 1).

Variation.- Size: TL 1.0-1.4 mm; W 0.7-0.8 mm. Color: varied, from light brown to brown-black.

Distribution.- Widely ranging in North America, Fig. 88. Recorded from: Alabama, Alberta, Arizona, British Columbia, California, Connecticut, Dakotas, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Manitoba, Michigan, Minnesota, Missouri, Montana, Nebraska, New Mexico, New York, North Carolina, Ohio, Ontario, Oregon, Pennsylvania, Saskatchewan, South Carolina, Utah, Washington, and Wyoming.

Collecting and natural history notes.- Habitat: coniferous and mixed forest, parkland. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 36.

3.5 Genus Stethorus Weise

Stethorus Weise, 1885:65. Type-species: Coccinella minima Rossi, 1794:89. (= Stethorus punctillum Weise, 1891:781). Subsequently designated by Korschefsky,

1931:111.

Derivation of name.- From Greek, "breast+margin" in reference to shape of prosternum.

The North American species of this genus have been studied by Casey (1899), Brown (1950). Dobzhansky (1924) segregated this genus from Scymnini and erected tribe Stethorini. Kapur (1948) monographed the Old World species, and Sasaji (1971) provided an account of the Japanese species.

Comparison.- Anteriorly deflexed prosternum partially covering mouthparts readily separate members of this genus from other Coccinellidae recorded from the study area.

Description.- Minute to small (1.0-1.8 mm) Stethorini. Body short to elongate oval, moderately to prominently convex. Color: most specimens entirely brown-black to black; antennae and mouthparts yellow to brown; tibiae and tarsi in some species yellow. Vestiture: dorsal surface pubescent; eyes with interfacetal hairs; ventral surface and legs setose. Sculpture: pronotum and elytra indistinctly punctate; ventral surface more distinctly punctate, especially basisternum. Head: antennae of 11 articles each, relatively short, clavate. Thorax: prosternum not carinate, anterior margin of basisternum markedly sinuate. Elytra: margins narrowly beaded; epipleura not foveate. Legs: normal, tibia slender, anterior edge not modified; tarsal formula 3-3-3, claws appendiculate. Abdomen: metacoxal arcs complete, semicircular. Male genitalia (figured by Kapur, 1948): lateral lobes very slender.

Distribution.- Northern Hemisphere. Genus with more than 10 species included, 3 species recorded from North America.

Natural history.- Both larvae and adults feed as specialized predators on tretranychid mites (Acarina). Kapur (1948) reviewed the literature on hosts of several Palaearctic Stethorus species. Bionomics of S. punctillum in North America was described by Putman (1955a). Collyer (1953) gave an account of bionomics of S. punctillum in England. Notes on natural history of S. picipes Casey were given by Newcomer and Yothers (1929), and S. punctum by Robinson (1953). The three North American Stethorus species overwinter as adults in leaf litter and cracks and crevices of trees which were the hosts for their prey, tetranychid mites.

3.5.0 Key to species

1 (0) Mouthparts, antennae, tibiae and tarsi yellow..... ....S. punctillum Weise (5.1)

1' Legs entirely brown to black ....S. picipes Casey (5.2)

3.5.1 Stethorus picipes Casey

Stethorus picipes Casey, 1899:136. Type locality: "California." Type in USNM.

Comparison.- Distinguished from other North American *Stethorus* species by combination of characters: distribution range in western North America (Fig. 90); brown to black legs.

Description.- Habitus and maculation as in Fig. 2. Body minute, oval in outline prominently convex. Color: mostly black, except antennae and mouthparts yellow; femora, tibiae and tarsi brown to black. Sculpture: pronotum and elytra indistinctly punctate; punctation of sterna more distinct.

Variation.- Size: TL 1.0-1.3 mm; W 0.75-0.9 mm. Color: teneral specimens from yellow-brown to jet black in mature individuals. Color of legs varied, from yellowish-brown to black.

Distribution.- Pacific coast of North America, Fig. 90. Recorded from: California, southern British Columbia, Idaho, Oregon, and Washington.

Collecting and natural history notes.- Habitat: Recorded west of the Continental Divide, in interior British Columbia, in orchards infested with *Panonychus ulmi* (Koch), and *Tetranychus telarius* Linnaeus, (Tetranychidae).

Beating and beating tray seems to be one of the best techniques how to collect these minute beetles. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 45.

3.5.2 Stethorus punctillum Weise

Stethorus punctillum Weise, 1891:781. Type locality: "Germany." Type not studied.

Comparison.- Distinguished from other North American Stethorus species by characters given in the above key. S. punctum and S. punctillum can be separated only on the basis of male genital armature, described by Brown (1950).

Description.- Habitus and maculation as in Fig. 2. Body minute, oval, prominently convex. Color: mostly black except, antennae and mouthparts yellow; dorsal and ventral surface brown-black; proximal end of femora, tibiae and tarsi yellow. Immature stages described by Putman (1955b).

Variation.- Size: TL 1.4-1.5 mm; W 1.0 mm.

Distribution.- Palaearctic Region, introduced to North America. Recorded from: eastern coast (ca. 1900), western coast (ca. 1970); British Columbia, Washington, Idaho and Oregon.

Collecting and natural history notes.- Habitat: orchards, parkland. Most abundant west of the Cascade Mountains. In most instances, found together with the previous species. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 18.

3.6 Genus Didion Casey

Didion Casey, 1899:134, 137. Type-species: Didion longulum Casey, 1899:137. Subsequently designated by Korschefsky, 1931:111.

Derivation of name.- origin unknown.

Comparison.- Distinguished from other North American Scymnini by combination of characters: body elongate oval (Fig. 3); pronotum with sides sub-parallel, narrower than elytra; ultimate article of maxillary palpus conical, obliquely truncated.

Description.- Scymnini of medium size (1.5-2.0 mm). Body elongate oval, convex. Color: head black, pronotum brown-black; elytra mostly black, maculate or not, if maculate each elytron with large, oval median spot; ventral surface and legs brown to black. Head: antennae of 11 articles each, relatively short, clavate; maxillary palpus of 3 articles each, ultimate article conical, obliquely truncated; mandibles bifid at apex. Legs: normal, tarsal formula 4-4-4; claws appendiculate.

Distribution.- North America, with four species included.

Natural history.- Wingo (1956) reported D. punctatus to feed on two-spotted spider mites on cedar near Ames, Iowa.

3.6.0 Key to species

1 (0) Dorsal surface of elytra black, immaculate 2

1' Elytra maculate, each elytron with reddish-orange discal spot ....*D. punctatum* (Melsheimer) (6.3)

2 (1) Pronotum distinctly punctate, punctures well impressed ....*D. nanus* (LeConte) (6.2)

2' Pronotum indistinctly punctate, punctures shallow.........................*D. longulum* Casey (6.1)

3.6.1 *Didion longulum* Casey

Didion longulum Casey, 1899:137. Type locality: "California (north of San Francisco)." Type in USNM.

Comparison.- Distinguished from *D. nanus* by indistinct punctation of pronotum; geographic distribution range, west of the Continental Divide (Fig. 89); details of male genital armature (compare with *D. nanus*, figured by Wingo, 1956).

Description.- Habitus and maculation as in Fig. 3. Body elongate oval, oblong. Color: head black; mouthparts and antennae brown; pronotum black and shiny; anterior angles and margin rufescent; elytra black, non-maculate; ventral surface brown-black; tibiae and tarsi rufescent, brownish-yellow. Vestiture: normal for genus. Sculpture: average for genus, see the above key.

Variation.- Size: TL 1.5-1.8 mm; W 0.9-1.1 mm.

Distribution.- Western North America, Fig. 89. Recorded from: Alberta, British Columbia, California, Idaho, Oregon, Washington, and Yukon.

Collecting and natural history notes.- Habitat: trees, shrubs and other plants infested with spider-mites. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 45.

3.6.2 Didion nanus (LeConte)

Scymnus nanus, LeConte, 1852:141. Type locality: "Missouri Territory." Type in MCZ, not studied.

Comparison.- Distinguished from other North American Didion species by combination of characters: immaculate elytra; distinct punctation of pronotum; details of male genital armature (figured by Wingo, 1956).

Description.- Habitus and maculation generally as in Fig. 3. Oval, convex. Color: head dark brown to black, paler toward clypeus; pronotum black with rufescent apical angles; elytra black, except apex paler. Sculpture: elytral microsculpture coarser than that on pronotum. Male genitalia (figured by Wingo, 1956): basal lobe considerably shorter than lateral lobes.

Variation.- Size: TL 1.2-1.5 mm; W 1.0-1.5 mm.

Distribution.- Widely ranging in North America. Recorded from: Arizona, California, Illinois, Florida, Iowa, Michigan, Nebraska, New Mexico, and Ohio.

Collecting and natural history notes.- This species was not collected in the study area by the author as yet, but its occurrence here is expected.

Number of specimens examined.- 2.

3.6.3 Didion punctatum (Melsheimer)

Scymnus punctatus Melsheimer, 1847: 180. Type locality: "Pennsylvania." Type not studied.

Comparison.- Distinguished from other North American Didion species by maculate elytra; each elytron with red-orange, discal spot.

Description.- Habitus and maculation as in Fig. 4. Elongate oval, oblong. Color: head, pronotum and elytra black; each elytron with median red-orange spot; ventral side mostly black, except femora and tibiae brown-black, and tarsi and mouthparts pale brown. Sculpture: punctation of elytra more distinct than that of pronotum.

Variation.- Size: TL 1.5-1.8 mm; W 1.0-1.2 mm. The red spot on each elytron is quite varied in size and shape.

Distribution.- Widely ranging in North America. Recorded from: Alberta, Dakotas, Illinois, Iowa, Kansas, Manitoba, Minnesota, Missouri, Ohio, Pennsylvania, Saskatchewan, Texas, and Wisconsin.

Collecting and natural history notes.- The two specimens known from southern Alberta were collected at Medicine Hat (Fig. 89). For list of localities within the study area see Appendix "A".

Number of specimens examined.- 2.

3.7 Scymnus (sensu stricto) Kugelann

Scymnus Kugelann, 1794:545, 546. Type-species: Scymnus nigrinus Kugelann, 1794:548. Subsequently designated by Korschefsky, 1931:115.

Note on type species.- The designation of Coccinella frontalis Fabricius, 1787:60, by Crotch (1874:239) is invalid. This species was not among the originally included species, and therefore cannot serve as the type-species.

Derivation of name.- From Greek, meaning lions' cub, in reference to resemblance of these pubescent beetles to little lions.

The North American species of this genus have been studied by: Horn (1895); Casey (1899); Wingo (1952). The genus was recently revised on the continental basis by

Gordon (1976). The Japanese species were monographed by Sasaji (1971). Mader (1924) provided keys to European species.

Comparison.- Distinguished from other North American Scymninae by: antennae of 11 articles; distinct prosternal carinae; and metacoxal arcs incomplete, subparallel with sternal margin.

Description.- Body small to medium in size, short oval to elongate, moderately convex. Color: predominantly black, brown to rufo-flavate. Prontum, elytra, and legs in some species orange-yellow to reddish-orange. Vestiture: both dorsal and ventral surface, including legs generally profusely pubescent. Sculpture: frons indistinctly to prominently punctate, pronotum generally distinctly punctate; elytra prominently punctate, punctures in some species very prominent. Head: transverse quadrate with rounded corners; eyes normal, not prominently emarginate by post antennal processes; antennae of 11 articles each. Ultimate article of maxillary palpus longer than wide. Thorax: prosternum T-shaped, with or without distinct carinae. Legs: normal, moderately stout and short; tarsal formula 4-4-4, article 3 greatly reduced, claws appendiculate.

Variation.- Color: head in some species yellow in males, light brownish-yellow in females but this is not constant (Horn, 1895). Elytra vary in outline from species to species, dorsal surface covered densely to sparsely with punctures and pubescence. In species with maculate elytra extent of maculation varied. The shape of tarsal claws varied between species and in some species between sexes.

Distribution.- World wide group, with more than 200 species included, 82 species recorded from North America (Gordon, 1976).

Natural history.- Members of this group are predaceous on scale insects and mites, both as larvae and adults.

3.7.0 Key to species

1 (0) Pronotum and elytra mostly black 2

1' Pronotum and elytra rufoflavate....................
..............................*S. phelpsi* Crotch (7.4)

2 (1) Elytra entirely black or only apex narrowly rufescent 3

2' Elytra with apical 1/4-1/3 orange-brown...........
..............................*S. opaculus* Horn (7.3)

3 (2) Body short oval, apex not distinctly orange-brown. Sterna brown-black. ....*S. caurinus* Horn (7.5)

3' Body elongate oval, apex of elytra narrowly orange-brown. Sterna orange-brown. 4

4 (3). Basal lobe of male genitalia longer than lateral lobes, parallel sided for basal 2/3, constricted to blunt point. Lateral lobes triangular, broader at base. Sipho with fish hook-like projection at apex.

............................*S. paracanus* Chapin (7.2)

4' Basal lobe longer than lateral lobes, broad basally, gradually rounded at apex. Lateral lobes elongate oval, slightly broader at base. Sipho with fish hook-like projection at apex ....

............................*S. apicanus* Chapin (7.1)

3.7.1 *Scymnus* (*Scymnus*) *apicanus* Chapin

Scymnus (*Scymnus*) *apicanus* Chapin, 1973:1071. Type locality: "Ascension Parish, Louisiana." Type in USNM.

Scymnus (*Scymnus*) *apicanus* *borealis* Gordon, 1976:in press.

Comparison.- Distinguished from other North American *Scymnus* species by: general habitus and maculation; details of male genital armature (sipho with fish-hook like projection at apex); transcontinental range in North America, east of the Rocky Mountains (Fig. 92).

Description.- Habitus and maculation as in Fig. 5. Color: head, mouthparts, and antennae reddish yellow; pronotum reddish orange with median arcuate black spot at base, extended anteriorly 4/5 of length; elytra mostly black, narrowly reddish-yellow apically; ventral surface mostly black, except prosternum black at middle, reddish yellow laterally; meso- and metasternum black; abdomen with first 3 sterna black medially, pale laterally, remainder reddish yellow; legs reddish yellow. Male genitalia (figured by Chapin, 1973): basal lobe little longer than lateral lobes, broad at base, gradually rounded to a point at apex; each lateral lobe fringed with setae except at basal half of dorsal edge. Sipho with fish-hook like projection at apex.

Variation.- Size: TL 2.1-2.6 mm; W 1.6-1.9 mm. There is some variation in size of pronotal spot, width of yellow band at apical edge of elytra, and extent of black on abdominal sterna.

Distribution.- Widely ranging in North America, Fig. 92. Recorded from: Alberta, Iowa, Manitoba, Minnesota, Saskatchewan, and Wisconsin.

Collecting and natural history notes.- Habitat: grassland and parkland of southeastern Alberta. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 6.

3.7.2 Scymnus (Scymnus) paracanus Chapin

Scymnus (Scymnus) paracanus Chapin, 1973:1071. Type locality: "Shangaloo, Louisiana." Type in USNM.

Scymnus (Scymnus) paracanus linearis Gordon, 1975:in press.

Comparison.- Distinguished from other North American

Scymnus species by: general habitus and maculation (Fig. 5), see the above key; shape of lateral and basal lobes of male genital armature (figured by Gordon, 1976); size (TL 2.4-2.8 mm).

Description.- Habitus and maculation as in Fig. 5. Color: head, mouthparts, and antennae reddish yellow; pronotum reddish yellow with median arcuate black spot at base which extends anteriorly 3/4 length; elytra black, apical edge broadly reddish yellow; prosternum reddish yellow, darker between coxae; mesosternum and metasternum black, abdominal sterna reddish brown; legs reddish yellow. Male genitalia (figured by Chapin, 1973): basal lobe longer than lateral lobes, parallel sided for basal 2/3, narrowing to blunt point; each lateral lobe triangular, broader at base, fringed with setae, except basal half of dorsal edge; sipho with fish-hook like projection at apex.

Variation.- Size; TL 2.4-2.8 mm; W 1.7-1.9 mm. Color: width of yellow band at apex of elytra varied.

Distribution.- Wide ranging in interior North America, Fig. 93. Recorded from: southern Alberta, Louisiana, southern Manitoba, Missouri, and southern Saskatchewan.

Collecting and natural history notes.- Habitat: grassland and parkland, within the study area apparently restricted to southeastern Alberta. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 16.

3.7.3 Scymnus (Scymnus) opaculus Horn

Scymnus opaculus Horn, 1895:96. Type locality: "Colorado." Type not studied.

Comparison.- Similar to Scymnus (Pullus) postpinctus Casey but larger and distinguished by complete metacoxal arcs.

Description.- Habitus and maculation as in Fig. 6. Body elongate oval, convex. Color: head black; anterior margin orange-yellow; mouthparts and antennae orange-yellow; pronotum mostly black, except anterior angles orange-yellow; elytra mostly black, maculate at apical 1/3 to 1/2 with orange-yellow spots; ventral surface black, except sterna V-VI orange-yellow, legs orange-yellow.

Variation.- Size: TL 1.8-2.3 mm; W 1.5 mm.

Distribution.- Widely ranging in North America, Fig. 94. Recorded from: southern Alberta, southern British Columbia, Colorado, Idaho, Illinois, Indiana, Michigan, Minnesota, Montana, North Dakota, Ohio, Saskatchewan, Wisconsin, and Wyoming.

Collecting and natural history notes.- Habitat: parkland, savannas, grassland, and prairie of southern British Columbia and Alberta. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 25.

3.7.4 *Scymnus* (*Scymnus*) *phelpsi* Crotch

Scymnus phelpsii Crotch, 1874a:77. Type locality: None specified, "Victoria and New Westminster." Type not studied.

Comparison.- Distinguished from other North American species in this genus by: general habitus and maculation (Fig. 7); size (TL 1.7-2.7 mm); distribution range in western North America (Fig. 91); details of male genital armature (figured by Gordon, 1976).

Description.- Habitus as in Fig. 7. Body short oval, moderately convex. Color: head, pronotum and elytra rufotestaceous; ventral surface, meso- and metasterna and basal abdominal sterna black, except legs rufotestaceous. Vestiture: normal for genus. Sculpture: normal for genus, head and pronotum sparsely punctate, punctures of elytra larger.

Variation.- Size: TL 1.7-2.7 mm; W 1.0-1.7 mm.

Distribution.- Western North America, Fig. 91. Recorded from: southern British Columbia, California, Nevada, western Washington, Oregon and southwestern Idaho.

Collecting and natural history notes.- Habitat: parkland, chapparal, in coastal British Columbia. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 28.

3.7.5 Scymnus (Scymnus) caurinus Horn

Scymnus caurinus Horn, 1895:97. Type locality: none speciefied. Type not studied.

Comparison.- Distinguished from other North American Scymnus (sensu stricto) species by: general habitus and maculation, size (TL 2.0-2.6 mm); geographic distribution range in western North America.

Description.- Habitus and maculation generally similar to S. lacustris (Fig. 7). Body broadly oval, convex, outline continuous. Color: entirely piceous, except in some specimens, frons and lateral margins of pronotum orange-yellow. Legs reddish-yellow. Vestiture: normal for genus. Sculpture: head sparsely punctate, pronotum finely but sparsely punctate; elytra distinctly but not closely punctate; sterna densely punctate;

Variation.- Size: TL 2.0-2.6 mm; W 1.4 mm.

Distribution.- Western North America. Recorded from: southern British Columbia, California, Idaho, Oregon, Utah and Washington.

Collecting and natural history notes.- Habitat: chapparal communities in southern British Columbia. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 12.

3.8 *Scymnus* (*Pullus*) Mulsant

Pullus Mulsant, 1846:241. Type-species: *Coccinella subvillosa* Goeze, 1777:247. Subsequently designated by Korschefsky, 1931:116.

Derivation of name.- From Greek, *Pullus* = "a young bird in the downy stage", presumably in reference to small size, and pubescent body.

The North American species of this group have been studied by: Horn (1895); Casey (1899); Wingo (1952), and revised on the continental basis by Gordon (1976). The Japanese species were monographed by Sasaji (1971).

Comparison.- Distinguished from *Scymnus sensu stricto* by: complete metacoxal arcs, extended to basal margin of sternum IV. Sasaji (1971) pointed out that separation of *Pullus* and *Scymnus* is arbitrary, based on extent of variation in metacoxal arcs. Tentatively, I follow segregation of *Pullus* from *Scymnus sensu stricto* proper until results from further study of this group provide evidence to the contrary.

3.8.0 Key to species

1 (0) Elytra mostly black, if pigmented only apex yellow-orange 2

1' Elytra mostly orange-brown, lateral margins, base, and suture brown. Pronotum mostly brown, except anterior angles orange-brown .... *S.* (*P.*) *coniferarum* Crotch (8.6)

2 (1) Elytra almost entirely black, except apices narrowly margined yellow-orange, or rufescent 3

2' Elytra mostly black, except apical 1/3 maculate with large, yellow-orange oval spots. Pronotum mostly yellow-orange, maculate with semicircular basal black spot ......*S.* (*P.*) *postpinctus* Casey (8.1)

3 (2) Pronotum mostly yellow-orange, maculate with basal black spot, or black with anterior angles orange-brown 4

3' Head, pronotum and legs uniformly yellow-orange................................*S.* (*P.*) *carri* Gordon (8.3)

4 (3) Legs bicolorous; femora brown-black, except distal end; tibiae and tarsi yellow-orange 5

4' Legs brown-black. Pronotum mostly yellow-orange, maculate with basal black spot. Males with setigerous tubercle on sternum III.................................... *S.* (*P.*) *marginicollis* Mann. (8.2)

5 (4) Sternum III of males with polished median spot, surrounded by dense setation. Sternum VI with pronounced depression in middle...................................... *S.* (*P.*) *lacustris* LeConte (8.5)

3.8.1 *Scymnus* (*Pullus*) *postpinctus* Casey

Scymnus postpinctus Casey, 1899:141. Type locality: "Wyoming." Type in USNM.

Comparison.- Distinguished from other North American S. (Pullus) species by: general habitus and maculation (pronotum with wide, yellowish-orange, lateral margins, elytra black, except apical 1/3 maculate with large, oval yellowish-orange spots); size (TL 1.8-2.3 mm); geographic distribution range in western North America (Fig. 95).

Description.- Habitus and maculation as in Fig. 6. Body elongate,oval, convex. Color: head orange-yellow to brown; mouthparts and antennae yellow; pronotum orange-yellow with black median spot at base; elytra mostly black, except apical 1/3 with large, oval orange-yellow spot; ventral surface black, except legs orange-yellow.

Variation.- Size: TL 1.8-2.3 mm; W 1.5 mm. Size of elytral maculation varied.

Distribution.- Western North America, Fig. 95. Recorded from: Alberta, British Columbia, Idaho, Montana, Oregon, Saskatchewan, and Wyoming.

Collecting and natural history notes.- Habitat: grasslands and parkland. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 19.

3.8.2 *Scymnus* (*Pullus*) *marginicollis* Mannerheim

Scymnus marginicollis Mannerheim, 1843:313. Type locality: "California." Type not studied.

Scymnus (*Pullus*) *marginicollis borealis* Hatch, 1962:150. Type locality: "Walla Walla, Washington." Type not studied.

Comparison.- Similar to *S. ardelio* Horn, and *S. lacustris* LeConte, from which males are distinguished by small setigerous tubercle on sternum III.

Description.- Habitus and maculation as in Fig. 11. Body broadly oval, moderately convex. Color: head orange yellow to black; mouthparts and antennae rufescent; pronotum mostly orange-yellow; elytra black; ventral surface brownish black, except legs dark brown to black, tarsi and tibio-femoral joints rufescent.

Variation.- Size: TL 1.5-2.0 mm. Extent of coloration of head and pronotum varied. Color: head orange-yellow to black, sexually dimorphic; males with head predominantly orange-yellow; pronotum entirely black to entirely orange-yellow; median dark area reduced in some specimens to narrow strip or basal spot.

Distribution.- Western North America, Fig. 100. Recorded from: southern Alberta, southern British Columbia, California, Idaho, Montana, Oregon, and Washington.

Collecting and natural history notes.- Collected beating Pinus ponderosa in coastal British Columbia. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 8.

3.8.3 Scymnus (Pullus) carri Gordon

Scymnus (Pullus) carri Gordon, 1976: in press. Type locality: "Medicine Hat, Alberta." Type in USNM.

Comparison.- Distinguished from other North American scymnines recorded from the study area by: entirely orange-yellow head and pronotum, immaculate black elytra; size (TL 2.3 mm); restricted distribution range (recorded from Alberta and Saskatchewan only).

Description.- Habitus and maculation similar to Fig. 11. Body elongate oval, oblong. Color: head orange-yellow; mouthparts and antennae orange-yellow; pronotum entirely orange-yellow, elytra mostly black, except apices narrowly rufous; ventral surface orange-yellow (sterna) to dark brown; legs orange-yellow.

Variation.- Size: TL 2.3 mm; W 1.8 mm.

Distribution.- Southern Alberta and Saskatchewan, Fig. 96.

Collecting and natural history notes.- Habitat:

grasslands of southern Alberta and Saskatchewan. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 10.

3.8.4 Scymnus (Pullus) aquilonarius Gordon

Scymnus (Pullus) aquilonarius Gordon, 1976:in press.

For description, comparison and other details, see Gordon (1976). Described from single specimen, not studied by me.

Distribution.- Recorded from: southern Alberta only (Fig. 96).

Collecting and natural history notes.- Habitat: grasslands of southern Alberta. For list of localities within the study area see Appendix "A".

Number of specimens examined.- none.

3.8.5 Scymnus (Pullus) lacustris LeConte

Scymnus lacustris LeConte, 1850:239. Type locality: "Lake Superior."

Scymnus tahoensis Casey, 1899:150. Type locality: "Lake Tahoe, California." Type in USNM. Synonymized by Gordon (1976:in press).

Comparison.- Distinguished from other North American

Scymnus (Pullus) species by: entirely black pronotum, bicolored legs and distinctly punctate pronotum and elytra.

Description.- Habitus and maculation as in Fig. 7. Body oval, oblong, pubescent. Color: head black; frons orange-yellow to brown-black; mouthparts and antennae orange-yellow; pronotum and elytra mostly black, except apical margin narrowly bordered orange-brown; ventral surface black, except femora brown-black, distally orange-yellow; tibiae and tarsi orange-yellow.

Variation.- Size: TL 1.9-2.6 mm; W 1.5-1.7 mm. Extent of orange-yellow portion of frons varied, from very narrow anterior band to wide, interocular band.

Distribution.- Widely ranging in North America, Fig. 99. Recorded from: Alberta, British Columbia, California, Dakotas, Idaho, Indiana, Manitoba, Michigan, Minnesota, Montana, Ontario, Oregon, Saskatchewan, Utah, Washington, and Yukon.

Collecting and natural history notes.- Habitat: grassland, xeric savannas, parkland. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 65.

3.8.6 Scymnus (Pullus) coniferarum Crotch

Scymnus coniferarum Crotch, 1874a:77. Type locality:

None specified, "Calaveras, Taho, San Barnardino." Type not studied.

Comparison.- Distinguished from other North American Pullus species by: size (TL 1.5-1.9 mm); habitus and maculation (Fig. 23); and distribution range in western North America (Fig. 98).

Description.- Habitus and maculation similar as in Fig. 10. Body elongate oval, convex. Color: pronotum black, front angles reddish; elytra rufotestaceous, suture narrowly black except extreme apex; elytral triangular maculation black, extended along basal margin and posteriorly along lateral margin; ventral surface and legs black. Abdomen: metacoxal lines semicircular.

Variation.- Size: TL 1.5-1.9 mm; W 0.8-1.1 mm. Color: extent of dark, pigmented area of elytra varied.

Distribution.- Western North America, Fig. 98. Recorded from: southern British Columbia, California, Idaho, Oregon and Washington.

Collecting and natural history notes.- Habitat: On pine trees infested with scale insects. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 12.

3.8.7 Scymnus (Pullus) ardelio Horn

Scymnus ardelio Horn, 1895:105. Type locality: None specified. Type not studied.

Comparison.- Distinguished from other North American Scymnus (Pullus) species recorded from the study area by: dorsal surface of pronotum and elytra mostly black, except anterior angles of pronotum, and apices of elytra, narrowly bordered rufo-flavate. Ventral surface mostly black, except front legs and tibiae, tarsi of middle and hind legs orange-yellow.

Description.- Habitus and maculation as in Fig. 11. Body short oval, prominetly convex. Color: head orange-yellow; mouthparts and antennae orange-yellow; pronotum black, except anterior angles and lateral margins orange-yellow; elytra mostly black, except apices narrowly bordered orange-yellow; ventral surface black, except legs orange-yellow, hind femora brown-black.

Variation.- Size: TL 1.8-2.5 mm; W 1.2 mm.

Distribution.- Western North America, Fig. 97. Recorded from: southern Alberta, southern British Columbia, California, Idaho, Montana, Oregon, Utah, and Washington.

Collecting and natural history notes.- Habitat: xeric savannas, grassland, collected from Artemisia species in southern Alberta. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 17.

3.8.8 *Scymnus* (*Pullus*) *calaveras* Casey

Scymnus calaveras Casey, 1899:150. Type locality: "Mokelumne Hill, Calaveras Co., California." Type in USNM.

Comparison.- Distinguished from other North American *Pullus* species by: general habitus and maculation range (Fig. 7); size (TL 2.1-2.1 mm); distribution in western North America (Fig. 101).

Description.- Habitus and maculation as in Fig. 7. Body oval, prominently convex. Color: head black; frons narrowly orange anteriorly; mouthparts and antennae light brownish-yellow; pronotum and elytra black; ventral surface black, except distal end of femora, tibiae and tarsi orange-brown. Vestiture: normal for the genus, pubescence rufous. Sculpture: normal for genus, elytra distinctly punctate.

Variation.- Size: TL 2.1-2.2 mm; W 1.6 mm.

Distribution.- Western North America, Fig. 101. Recorded from: coastal California, southern British Columbia, Oregon, and Washington.

Collecting and natural history notes.- Habitat: coastal chapparal communities. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 18.

Species not studied.- The following species, specimens of which I did not see from the study area, were reported from southern British Columbia by Gordon (1976). These are: *Scymnus* (*S.*) *fenderi* Malkin, *Scymnus* (*Pullus*) *falli* Gordon, *S.* (*P.*) *humboldti* Casey, *S.* (*P.*) *iowensis* Casey, *S.* (*P.*) *erythronotum* Gordon, *S.* (*P.*) *aridus* Casey, and *S.* (*P.*) *impletus* Gordon.

3.9 *Nephus* (*sensu latiore*) Mulsant

Nephus Mulsant, 1846:237. Type-species: *Coccinella quadrimaculata* Herbst, 1783:30. (= *C. quadrilunata* Illiger, 1798:416). Subsequently designated by Korschefsky, 1931:116.

Derivation of name.- From Greek, *nephos* = cloud (dark colored); in reference to body color.

The North American species of this genus have been studied by Horn (1895), Casey (1899), Crotch (1873), and the group was recently revised on the continental basis by Gordon (1976). Sasaji (1971) provided account of the Japanese species.

Comparison.- Tarsal formula 3-3-3, and ankylosed scape and pedicel of antennae readily distinguish members of this genus from other scymnines.

Description.- Body oval, moderately convex. Head: antennae of 10 articles each, scape and pedicel fused. Legs: tibial spurs absent; tarsal formula 3-3-3, claws each with acute basal tooth. Male genital armature (figured by Sasaji, 1971): basal lobe symmetrical.

Distribution.- Northern Hemisphere, transcontinental in North America. Genus with more than 100 species included.

3.9.0 Key to species

1 (0) Each elytron maculate with single ferrugineous to reddish-orange spot 2

1' Each elytron maculate with two spots 3

2 (1) Dorsal surface mostly piceous to ferrugineous, each elytron with relatively large oval, yellow-orange spot, extended from humeral angle almost to margin and suture, but not to apex. Base of elytra and suture pigmented brown-black. Legs orange-yellow to light brown ....*N. sordidus* (Horn) (9.3)

2' Dorsal surface mostly black, except each elytron with small, reddish-orange spot in apical third. Ventral surface piceous, except legs rufotestaceous ....*N. georgei* (Weise) (9.2)

3 (1') Each elytron with two obliguely oval, relatively large, not well defined, orange-yellow spots. Spots in some specimens contiguos ....

.........................N. *ornatus* (LeConte) (9.1)

3.9.1 *Nephus ornatus* LeConte

Scymnus ornatus LeConte, 1850:239. Type locality: "Lake Superior." Type in MCZ, not studied.

Scymnus naviculatus Casey, 1899:155. Type locality: "Colorado." Type in USNM. Synonymized by Gordon (1976:in press).

Comparison.- Distinguished from other North American *Nephus* species by: general habitus and maculation (Fig. 22); size (TL 1.6-2.0 mm); details of male genital armature (figured by Gordon, 1976).

Description.- Habitus and maculation as in Fig. 22. Body oval, convex. Color: head black; mouthparts and antennae light brownish-yellow; pronotum and elytra black; each elytron with two, obliquely oval, orange-yellow spots; ventral surface black, except legs rufo-brown, femora brown.

Variation.- Size: TL 1.6-2.0 mm; W 0.8-1.2 mm.

Distribution.- Widely distributed in North America, Fig. 105. Recorded from: southern Alberta, southern British Columbia, Colorado, Illinois, Indiana, Iowa, Manitoba, Massachusetts, Minnesota, North Dakota, Ontario, Quebec, Saskatchewan, and Wisconsin.

Collecting and natural history notes.- Habitat: prairie, grassland, cultivated fields, and parkland. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 6.

3.9.2 Nephus georgei (Weise)

Scymnus bisignatus Horn, 1895:92. Type locality: Siskiyou County, California." Type not studied.

Scymnus georgei Weise, 1929:33. New name.

Comparison.- Distinguished from other North American Nephus species by details of male genital armature (see Gordon, 1976).

Description.- Habitus and maculation as in Fig. 8. Body oval, moderately convex. Color: mostly black, each elytron maculate with transversely oval red spot; ventral surface black, except tibiae and tarsi rufotestaceous, femora light brownish-yellow. Sculpture: head indistinctly punctate; pronotum finely punctate; elytra coarsely not closely punctate. Abdomen: metacoxal lines distant from sternal margin, not parallel with it, but slightly arcuate anteriorly.

Variation.- Size: TL 1.5-1.7 mm; W 0.8 mm.

Distribution.- Western North America, Fig. 102.

Recorded from: Alaska, Alberta, British Columbia, California, Oregon, Northwest Territories, and Yukon.

Collecting and natural history notes.- Habitat: parkland, boreal forest. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 12.

3.9.3 *Nephus sordidus* (Horn)

Scymnus sordidus Horn, 1895:93. Type locality: "Los Angeles, California." Type not studied.

Comparison.- Distinguished from other members of *Nephus* by: general habitus and maculation (Fig. 9); male genitalia (see Gordon, 1976); and geographic distribution range in western North America (Fig. 106).

Description.- Habitus and maculation similar as in Fig. 10. elongate oval, convex. Color: light brownish-yellow; each elytron with large paler spot covering most of it. Sculpture: head and pronotum scarcely punctate, elytra more closely punctate.

Variation.- Size: TL 1.5-2.0 mm; W 0.9-1.1 mm. Color: from ferrugineous to light brownish-yellow.

Distribution.- Western North America, Fig. 106. Recorded from: southern Alberta, Illinois, Indiana, southern Manitoba, Michigan, Minnesota, North Dakota, Ontario, South Dakota, and southern Saskatchewan.

Collecting and natural history notes.- Habitat: grasslands of southern Alberta and Saskatchewan. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 3.

3.10 Genus *Hyperaspidius* Crotch

Hyperaspidius Crotch, 1873:382. Type-species: *Chrysomela trimaculata* Linnaeus, 1762:592. Designated by Crotch, 1873:382; original designation.

Derivation of name.- Origin unknown, presumably named in reference to resemblance to *Hyperaspis*.

Comparison.- Distinguished from other North American Hyperaspini by combination of characters: anterior margin of submentum straight; epipleura not foveate for reception of hind femora; front tibiae not spinose; tarsal claws simple (Fig. 182).

Description.- Habitus and maculation as in Fig. 16. Hyperaspini of small to medium size (1.0-4.0 mm). Body elongate oval, oblong. Color: from pale yellow, flavate to brown-black; maculate specimens with brown-black longitudinal vittae on pale yellow background of elytra; melanic specimens with pronotum and anterior angle of elytra yellow-orange, specimens of some species brown-black entirely. Vestiture: dorsal surface glabrous, ventral surface and legs setose. Sculpture: head finely punctate; pronotum shagreened; elytra shiny, punctures larger, unequal. Head: eyes narrowly emarginate, in some species with greenish-blue lustre; antennae of 11 articles each, relatively short; mandibles bifid at apex; maxillary palpus of 3 articles each, ultimate article trapezoidal; pronotum and elytra compact; anterior margin of pronotum recessed above eyes, posterior margin narrowly beaded. Elytra: margins narrowly reflexed; suture narrowly beaded; apical angle nearly rectangular. Legs: front tibiae not modified or spinose; tarsal formula 4-4-4, claws simple (Fig. 182). Abdomen: metacoxal arcs complete or incomplete, semicircular (Figs. 179, 180).

Distribution.- North and Middle American genus with highest diversity in southwestern United States.

Natural history.- Very little is known about life histories for members of this genus. Taken from a specimen label, note on host data: "On cottony cochineal scale of cactus; Phoenix, Arizona."

3.10.0 Key to species

1 (0) Elytra yellow with three, longitudinal, black vittae 2

1' Elytra brown-black ....H. *arcuatus* (LeConte) (10.3)

2 (1) Body length ca. 4.0 mm ....H. hercules, n. sp. (10.1)

2' Body length ca. 2.0 mm ....H. vittigerus (LeConte) (10.2)

3.10.1 Hyperaspidius hercules, new species

Hyperaspidius hercules, new species. Type locality: Medicine Hat, Alberta. Holotype: male, labelled - Holotype (red border, circular label). Medicine Hat, 03.VII.1932. F.S. Carr collector. Deposited in CNC. Paratypes: two males, three females; labelled - Paratype (yellow border, circular label). For dates and localities, see Appendix "A". Deposited in UASM.

Derivation of specific epithet: named in reference to size, largest member of genus.

Comparison.- Distinguished from other North American members of this genus by: large size (TL 3.8-4.0 mm), maculation of pronotum and elytra (Fig. 12), and restricted geographic range in northern, western North America (Fig. 104).

Description.- Habitus and maculation as in Fig. 10. Body elongate oval, oblong. Color: head brown-black, anterior margin of frons orange-brown; eyes finely faceted, with bluish lustre; mouthparts and antennae yellow-brown; pronotum mostly black, except lateral margin widely, and anterior narrowly bordered yellow; scutellum black; elytra yellow, each elytron with longitudinal discal vitta, dark brown to black in color; extended from humeral calus posteriorly, joined to sutural vitta before apex, and at apex joined to lateral emargination; ventral surface and legs rufous to light brown. Abdomen: metacoxal arcs complete. Male genital armature (Figs. 170B, 170C, 170D): median lobe slender, arcuate tube, siphonal capsule present; basal lobe asymmetrical, shorter than lateral lobes. Female genital armature (Fig. 170A): spermatheca retort-shaped.

Note on relationship.- This species is most closely related to H. insignis, based on size, and the shape of basal lobe of male genital armature (Fig. 170D).

Variation.- Size: TL 4.0 mm; W 3.5 mm. Color: head dark brown in females, yellow in males.

Distribution.- Western North America, Fig. 104. Recorded from: southern Alberta and Montana.

Collecting and natural history notes.- Habitat: grasslands and xerix savannas. In the study area restricted to southeastern Alberta. The five specimens known were collected during June and July, respectively. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 6.

3.10.2 Hyperaspidius vittigerus (LeConte)

Hyperaspis vittigera LeConte, 1854:133. Type locality: "Missouri." Type in MCZ, not studied.

Hyperaspidius trimaculatus: Crotch, 1873:873. Not Linnaeus, 1762. Misidentification.

Hyperaspidius oblongus Casey, 1908:421. Type locality: "El Paso, Texas." Type in USNM. Synonymized by Wingo, 1952:26.

Hyperaspis wolcotti Nunenmacher, 1911:74. Type locality: "Buffington, Indiana." Type in CAS. Synonymized by Wingo, 1952:26.

Comparison.- Distinguished from other North American members of this genus by medium size (TL 1.9-2.2 mm), maculation (Fig. 12), and transcontinental range (Fig. 107) in North America.

Description.- Habitus and maculation as in Fig. 12. Body elongate oval, oblong. Color: head dark brown, mouthparts and antennae light brownish-yellow; pronotum brown, lateral margins yellow; elytra yellow, each with longitudinal, brown-black vitta, connected to sutural vitta before apex; sutural vitta expanded at middle, apex narrowly emarginated brown-black. Sculpture: dorsal surface punctate, ventral surface and legs light brown, punctation distinct, without isodiametric meshes between punctures.

Variation.- Size: TL 1.9-2.2 mm; W 1.2-1.4 mm. Color: head black in females, yellow in males.

Distribution.- Widely ranging in North America, Fig. 107. Recorded from: Alberta, British Columbia, California, Colorado, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Manitoba, Montana, Minnesota, New Brunswick, New Jersey, New York, North Dakota, Nova Scotia, Ontario, Oregon, Ohio, Quebec, Saskatchewan, Texas, Utah, Virginia, Washington, Wyoming, and Yukon.

Collecting and natural history notes.- Habitat: grasslands of southern Alberta, also parkland and savannas. Most abundant in the southern portion of the study area. For list of localities, see Appendix "A".

Number of specimens examined.- 65.

3.10.3 _Hyperaspidius_ _arcuatus_ (LeConte)

Hyperaspis _arcuata_ LeConte, 1854:133. Type locality: "Gila River, California." Type in MCZ, not studied.

Comparison.- Similar to _H._ _immaculatus_ Hatch, specimens of which are on average larger, and differ in suffused maculation.

Description.- Habitus and maculation as in Fig. 16. Body elongate oval, oblong. Color: head yellow, vertex black; eyes with bluish-green lustre; mouthparts and antennae light brownish-yellow; pronotum and elytra dark brown; each elytron maculate with relatively small, yellow-orange lunate spot at humeral angles; margin and suture pigmented darker; ventral surface and legs light brownish-to dark brown; legs paler than sterna. Abdomen: metacoxal arcs complete.

Variation.- Size: TL 1.8-2.0 mm; W 0.9-1.0 mm. Color: head black brown in females, yellow marks on pronotum and elytra indistinct.

Distribution.- Pacific coast of North America, Fig. 103. Recorded from: British Columbia, California, Oregon, and Washington.

Collecting and natural history notes.- Habitat: I did not collect any specimens of this species. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 5.

3.11 Genus Hyperaspis Dejean

Hyperaspis Dejean, 1836:459. Type-species: Coccinella reppensis Herbst, 1784:48. Subsequently designated by Crotch, 1874:213.

Derivation of name.- From Greek, hyper+aspis, = excess+shield, in reference to shape of pronotum. First used by Dejean (1836), who credited its origin to

Chevrolat.

Oxynychus LeConte, 1850:694. Synonymized by Mulsant, 1850:238. Type-species: Oxynychus moerens LeConte, 1850:238. Fixed by monotypy. The subsequent designation of Coccinella erythrocephala Fabricius, 1787:61; by Korschefsky (1931:200), is invalid.

Note on synonymy.- Coccinella reppensis and Oxynychus moerens are, in my opinion congeneric taxa. Thus Oxynychus is a junior synonym of Hyperaspis. Members of Oxynychus were said to differ from Hyperaspis by simple tarsal claws. Mulsant (1850:694) indicated the possibility of congeneric status of the two. Dobzhansky (1941:78) treated Oxynychus as a synonym of Hyperaspis, and pointed out that simple tarsal claws have developed independently in several, not closely related sections of Hyperaspis, hence Oxynychus does not represent a natural group. Günther (1959) stated that the representatives of the above mentioned genera can not be segregated on the basis of structure of male genital armature, or any other structural character other than simple tarsal claws, and treated Oxynychus as a subgenus of Hyperaspis. Miyatake (1961) reached the same conclusion and followed Günther's example.

Comparison.- Distinguished from other North American Hyperaspini by asymmetrical basal lobe of male genital armature (Figs. 171A, 171B, 171C), not spinose anterior edge of front femora, foveate epipleura for reception of front and hind femora (Figs. 173, 174).

Description.- Small to medium sized (1.0-5.0 mm) Hyperaspini. Body oval to rounded oval in outline, convex to subhemispherical. Color: mostly black, maculate with yellow to orange spots and vittae; color of head and pronotum sexually dimorphic; lighter in males, brown-black in females; elytral maculation (Fig. 13-30), basically, each elytron maculate with with 5 yellow to orange spots, in some species fused into vittae, or missing. Vestiture: dorsal surface glabrous, underside and legs setose. Microsculpture (Figs. 84, 87, 187, 188): both ventral and dorsal surfaces punctate; generally, punctation of head finer than on pronotum, and on pronotum finer than on elytra; ventral punctation distinct, especially on meso- and metasternum, sterna (Fig. 188). Head: relatively small, eyes finely faceted, in many species with bluish-green lustre; antennae (Figs. 175, 177, 178), relatively short, of 11 articles; mandibles bifid at apex, bicuspidate at base; maxillary palpus securiform; anterior margin of submentum cordiform; labial palpus relatively short, (Fig. 191) of 2 articles. Elytra: epipleura narrow, distinctly foveate for reception of front and hind femora (Fig. 174); prosternum carinate. Legs: relatively short, retractile (Fig. 173); tibiae slender, not spinose; tarsal claws appendiculate (Fig. 186-188), to simple in some species (Fig. 190). Male genital armature (Figs. 171A, 171B, 171C): basal lobe asymmetrical, lateral lobes setose distally, equal to or longer than basal lobe. Female genitalia (Fig. 171D): spermatheca of 2 vesicles, retort-shaped, connected by thin, tubular duct.

Distribution.- Worldwide except Australia and New Zealand. Number of described species: 335 for the world, (Korschefsky, 1931); 28 Palaearctic Region (Iablokoff, 1971); 72 Nearctic Region (Dobzhansky, 1941). Fürsch (1972) reviewed the African fauna (54 species).

Natural history.- Predaceous upon aphids and coccids of Pulvinaria, Pseudococcus, and Phenacoccus species. Both adults and larvae of some species, e.g., Hyperaspis reppensis were reported as inquilines in ants' nests (Wheeler, 1911; Mann, 1911).

3.11.0 Key to species

1 (0) Elytra mostly black, distinctly maculate with yellow to orange-yellow spots and/or vittae 2

1' Elytra and pronotum brown-black, except traces of orange-brown maculation on lateral and anterior margins of pronotum, humeral angle of elytra. Alpine tundra of northern Rocky Mountains.................. ....H. jasperensis, n. sp.. (11.13)

2 (1) Each elytron maculate in addition to marginal vitta with distinct longitudinal discal vitta 3

2' Each elytron maculate with marginal vitta or/and spots, in some species confluent with marginal vitta 4

3 (2) Lateral margin of each elytron maculate with relatively narrow vitta extended to apex. Discal vitta extended diagonally across elytron, from humeral angle to apex. In some specimens feebly confluent with marginal vitta...H. quadrivittata LeConte (11.5)

3' Lateral margin of each elytron maculate with relatively narrow, abbreviated vitta, extended from humeral angle for 2/3 of length. Apex maculate with separate oval spot. Discal vitta abbreviated, extended diagonally from apex to mid-line ....H. oregona Dobzhansky (11.8)

4 (2') Each elytron maculate with apical spots only, or in some species with traces of marginal vitta at humeral angles 5

4' Each elytron maculate in addition to distinct marginal vitta with spots 6

5 (4') Each elytron maculate with single apical spot only ....H. postica LeConte (11.3)

5' Each elytron maculate with single apical spot, and traces of very abbreviated marginal vitta at humeral angles ....H. elliptica Casey (11.6)

6 (4') Marginal vitta abbreviated, not extended to apex ..8

6' Marginal vitta not abbreviated, extended to apex ..7

7 (6') Each elytron maculate with relatively wide marginal vitta only, extended from humeral angles to apex, shortly curved anteriorly .... *H. fimbriolata* (Melsheimer) (11.4)

7' Each elytron maculate with relatively wide, sinuate marginal vitta, and single discal spot.. *H. undulata* (Say) (11.7)

8 (6) Each elytron maculate in addition to marginal vitta with less than three spots each 9

8' Each elytron maculate in addition to relatively wide marginal vitta with three spots, arranged parallel to suture ....*H. levrati* Mulsant

9 (8) Each elytron maculate in addition to abbreviated marginal vitta with two spots 10

9' Each elytron maculate in addition to abbreviated marginal vitta with single spot each 13

10 (9) Marginal vitta relatively wide 12

10' Marginal vitta relatively narrow 11

11 (10) Marginal vitta relatively narrow, apical spot oval, smaller than discal spot .... *H. lugubris* (Randall) (11.12)

11' Marginal vitta relatively narrow, sinuate. Apical spot on each elytron round, relatively large, discal spot elongate oval (Fig. 19).. *H. simulatrix* Dobzhansky (11.11)

12 (10) Each elytron maculate in addition to abbreviated,

relatively wide marginal vitta, with oval apical spot, and large discal spot (in some specimens confluent with marginal vitta). Maculation yellow-orange to orange ....*H*. *lateralis* Mulsant (11.1)

12' Each elytron maculate in addition to abbreviated marginal vitta with relatively large lunate apical spot, and elongate discal spot. Maculation ochreous-yellow. Spots in some specimens confluent longitudinally ....*H*. *fastidiosa* Casey (11.2)

13(9') Marginal vitta relatively narrow, extended from humeral angle posteriorly 4/5. Apex of each elytron maculate with small, transverse oval spot.......... ....*H*. *lanei* Hatch (11.9)

13' Marginal vitta extended posteriorly 3/5, distinctly tapered. Apex of each elytron maculate with small, oval spot ....*H*. *dissoluta* Crotch (11.10)

3.11.1 *Hyperaspis lateralis* Mulsant

Hyperaspis lateralis Mulsant, 1850:657. Type locality: "le Mexique." Type not studied.

Hyperaspis laevipennis Casey, 1899:122. Type locality: San Diego, California. Type in USNM. Synonymized by Dobzhansky, 1941:15.

Hyperaspis pinguis Casey, 1899:122. Type locality: "Arizona". Type in USNM. Synonymized by Dobzhansky,

1941:15.

Hyperaspis montanica Casey, 1899:121. Type locality: "western Montana". Type in USNM. Synonymized by Dobzhansky, 1941:16.

Hyperaspis wellmani Nunenmacher, 1911:72. Type locality: "Goldfield, Nevada." Type in CAS. Synonymized by Dobzhansky, 1941:18.

Hyperaspis idae Nunenmacher, 1912:450. Type locality: Guerneville, California. Type in CAS. Synonymized by Dobzhansky, 1941:19.

Comparison.- Distinguished from other North American *Hyperaspis* species by: general habitus and maculation (Fig. 17); size (TL 2.6-3.8 mm); details of male genital armature (figured by Dobzhansky, 1941); and geographic distribution range in western North America (Fig. 108).

Description.- Habitus and maculation as in Fig. 17. Body broadly oval, prominently convex. Color: in males head and mouthparts yellow, pronotum with lateral and anterior margins narrowly bordered yellow; in females head black, pronotum mostly black, with or without reddish anterior angles; elytral maculation yellow to red; marginal vitta extended for basal 2/5, broad, parallel sided; discal spot round to longitudinally oval; apical spot round to transversely oval; ventral surface black, except epimera white in males, black in females; front legs, tibiae and tarsi of middle and hind legs brownish-yellow in males, in females only tarsi so colored. Legs: tarsal claws appendiculate (Figs. 181, 185). Male genital armature: basal lobe shorter than lateral lobes, asymmetrical (figured by Dobzhansky, 1941).

Variation.- Size: TL 2.6-3.8 mm; W 2.3-3.0 mm. Color and maculation: elytral maculation varied in extent and color from yellow to red; marginal vitta expanded and fused with enlarged discal spot; in some specimens vitta also coalesced with apical spot.

Distribution.- Western North America, Fig. 108. Recorded from: Alberta, Arizona, British Columbia, California, Colorado, Idaho, Mexico, Montana, Nevada, New Mexico, Oregon, South Dakota, Texas, Washington, and Wyoming.

Collecting and natural history notes.- Habitat: grasslands and parkland of southern Alberta. Arboricole on trees and shrubs infested with mealybugs and aphids. Also collected from several species of _Artemisia_, and other herbaceous plants. For list of localities within the study area see Appendix "A". Hosts: _Pseudococcus_ _sequoiae_, _P. aurilanatus_.

Number of specimens examined.- 135.

3.11.2 _Hyperaspis_ _fastidiosa_ Casey

Hyperaspis fastidiosa Casey, 1908:414. Type locality: San Diego, California. Type in CAS.

Hyperaspis fastidiosa septentrionis Dobzhansky, 1941:15. Type locality: Murtaugh, Idaho. Type in USNM (54201).

Comparison.- Distinguished from other North American Hyperaspis species by: general habitus and maculation (Fig. 13); size (TL 2.1-2.7 mm); details of male genital armature (figured by Dobzhansky, 1941); and distribution in western North America (Fig. 109).

Description.- Habitus and maculation as in Fig. 13. Body oval, prominently convex. Color: head yellow, vertex black; mouthparts and antennae yellow; pronotum mostly black, except lateral margins with large, quadrate mark; anterior margin yellow in males; elytra mostly black, each elytron maculate with lateral yellow vitta, posteriorly joined to subapical spot; anterior discal spot large, extended posteriorly and joined with subapical spot; basal margin, scutellum and suture black; apices emarginate black; ventral surface and legs light brown to brown-black; femora and tarsi light brownish-yellow.

Variation.- Size: TL 2.1-2.7 mm; W 1.6-1.9 mm. Color: dimorphic, head in females black, vertex yellow in males; pronotum of males with yellow anterior margin, dilated medially to various degree; elytral maculation confluent to various degree.

Distribution.- Western North America, Fig. 109. Recorded from: Alberta, Arizona, British Columbia, California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, and Wyoming.

Collecting and natural history notes.- Habitat: grasslands, parkland and xeric savannas in southern Alberta and British Columbia. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 38.

3.11.3 Hyperaspis postica LeConte

Hyperaspis postica LeConte, 1880:188. Type locality: "California."

Comparison.- Distinguished from other North American Hyperaspis species by: general habitus and maculation (Fig. 24); size (TL 2.3-3.1 mm); details of male genital armature (figured by Dobzhansky, 1941); distribution in western North America (Fig. 110).

Description.- Habitus and maculation as in Fig. 24. Body elongate oval, moderately convex. Color: head black; mouthparts and antennae yellow; pronotum mostly black, except lateral margins bordered yellow-orange; elytra mostly black, maculate with single, orange-yellow, oval, subapical spot each; ventral surface and legs brown-black; tarsi and tibiae distally, orange-brown. Sculpture: dorsal surface distinctly punctate, shiny; punctures unequal. Elytra: margins narrowly beaded; suture narrowly beaded. Legs: tarsal claws appendiculate.

Variation.- Size: TL 2.3-3.1 mm; W 1.7-2.2 mm.

Distribution.- Western North America, Fig. 110. Recorded from: Alberta, Arizona, British Columbia, California, Idaho, Oregon, Utah, and Washington.

Collecting and natural history notes.- Habitat: grasslands and parkland in southern Alberta and British Columbia. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 28.

3.11.4 Hyperaspis fimbriolata Melsheimer

Hyperaspis fimbriolata Melsheimer, 1847:180. Type locality: "Pennsylvania." Type not studied.

Hyperaspis rufomarginata Mulsant, 1850:661. Type locality: "l' Amerique boreale." Type not studied. Synonymized by Dobzhansky, 1941:54.

Hyperaspis limbalis Casey, 1899:126. Type locality: San Diego, California. Type in USNM. Synonymized by Dobzhansky, 1941:54.

Hyperaspis inflexa Casey, 1899:126. Type locality: "Dakota". Type in USNM. Synonymized by Dobzhansky, 1941:56.

Hyperaspis serena Casey, 1908:417. Type locality: "Pennsylavania". Type in USNM. Synonymized by Dobzhansky, 1941:55.

Comparison.- Distinguished from other North American *Hyperaspis* species by: general habitus and maculation (Fig. 14); size (TL 2.3-2.8 mm); details of male genital armature (figured by Dobzhansky, 1941); transcontinental range in North America (Fig. 112).

Description.- Habitus and maculation as in Fig. 14. Body oval, moderately convex. Color: head yellow in males with median black stripe, pronotum mostly black with yellow lateral margin; in females head and pronotum entirely black; elytral maculation yellow to orange; ~~marginal~~ vitta basal 1/4, sinuate; legs brown to black, tibiae and tarsi yellowish in males. Sculpture: microsculpture of pronotum dense, and fine; that of elytra more pronounced.

Variation.- Size: TL 2.3-2.8 mm; W 1.7-2.0 mm.

Distribution.- Widely ranging in North America, Fig. 112. Recorded from: Alberta, Arizona, British Columbia, California, Colorado, Florida, Illinois, Indiana, Iowa, Kansas, Louisiana, southern Manitoba, Maryland, Massachussetts, Michigan, Minnesota, Mississippi, Montana, Nebraska, New Mexico, New York, North Dakota, North Carolina, Oregon, Pennsylvania, Texas, southern Saskatchewan, South Dakota, Utah, Virginia, Washington, and Wyoming.

Collecting and natural history notes.- Habitat: grasslands, parkland and xeric savannas. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 45.

3.11.5 _Hyperaspis_ _quadrivittata_ LeConte

Hyperaspis _quadrivittata_ LeConte, 1852:133. Type locality: "Long's Peak." Type not studied.

Hyperaspis _tetraneura_ Casey, 1908:420. Type locality: "Boulder Co., Colorado." Type in USNM. Synonymized by Dobzhansky, 1941:75.

Comparison.- Distinguished from other North American _Hyperaspis_ species by: general habitus and maculation (Fig. 22); size (TL 2.0-2.7 mm); distribution in western North America (Fig. 113).

Description.- Habitus and maculation as in Fig. 22. Body elongate oval, oblong. Color: head yellow in males with black vertex; in females black entirely; pronotum in both sexes with yellow lateral margins; elytra mostly black, maculate with yellow to whitish-yellow spots;

marginal vitta extended posteriorly to apex, in some individuals united with discal vitta.

Variation.- Size: TL 2.0-2.7 mm; W 1.3-1.8 mm.

Distribution.- Western North America, Fig. 113. Recorded from: Alberta, Arizona, British Columbia, Colorado, Idaho, Iowa, Montana, Nebraska, New Mexico, Utah, and Wyoming.

Collecting and natural history notes.- Habitat: Collected only in southern British Columbia and Alberta. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 27.

3.11.6 Hyperaspis elliptica Casey

Hyperaspis elliptica Casey, 1899:126. Type locality: "California." Type in USNM.

Hyperaspis elliptica angustula Casey, 1899:127. Type locality: "Mendocino Co., California." Type in USNM. Synonymized by Dobzhansky, 1941:40.

Comparison.- Distinguished from other North American Hyperaspis species by: general habitus and maculation (Fig. 23); size (TL 2.6-3.2 mm); distribution range in western North America. Resembles H. postica from which it can be distinguished by larger size, more elongate outline and more distinct elytral microsculpture.

Description.- Habitus and maculation as in Fig. 23. Body outline oval, moderately convex. Color: head yellow in males with black median fascia; in females entirely black; pronotum in both sexes with yellow lateral margin; elytra mostly black, maculation yellow; apical spot transversely oval to triangular, closer to margin than to suture; ventral surface dark light brownish-yellow, except tibiae and tarsi yellowish in males, brown in females.

Variation.- ~~Size:~~ TL 2.6-3.2 mm; W 1.6-2.0 mm.

Distribution.- Western North America, Fig. 111. Recorded from: Alberta, British Columbia, California, Montana, and Washington.

Collecting and natural history notes.- Habitat: grassland, parkland and savannas in southern Alberta and British Columbia. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 18.

3.11.7 *Hyperaspis* *undulata* (Say)

Coccinella *undulata* Say, 1824:92. Type locality: "Missouri." Type lost.

Hyperaspis *maculifera* Melsheimer, 1847:179. Type locality: "Pennsylvania." Type not studied. Synonymized by

Dobzhansky, 1941:65.

Hyperaspis elegans Mulsant, 1850:658. Type locality: "l' Amerique boreale." Type not studied. Synonymized by Dobzhansky, 1941:65.

Comparison.- Distinguished from other North American Hyperaspis species by: general habitus and maculation (Fig. 25); size (TL 2.3-2.7 mm); wide range in North America; and details of male genital armature (figured by Dobzhansky, 1941).

Description.- Habitus and maculation as in Fig. 25. Body elongate oval, convex. Color: head black; pronotum mostly black, lateral margins orange-yellow; elytra mostly black, maculation orange-yellow; ventral surface and legs dark brown, tibiae and tarsi light brownish- yellow. Vestiture: normal for genus. Sculpture: dorsal surface punctate, shagreened, punctures shallow; pronotum distinctly punctate, shiny; elytral punctures unequal, isodiametric meshes absent.

Variation.- Size: TL 2.3-2.7 mm; W 1.4-1.9 mm.

Distribution.- Widely ranging in North America, Fig. 114. Recorded from: southern Alberta, southern British Columbia, Colorado, Dakotas, Kansas, Louisiana, Manitoba, Michigan, Minnesota, Nebraska, New Jersey, New York, Utah, and Texas.

Collecting and natural history notes.- Habitat: collected in southern Alberta and British Columbia. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 9.

3.11.8 Hyperaspis oregona Dobzhansky

Hyperaspis oregona Dobzhansky, 1941:76. Type locality: " Harney Co., Oregon." Type in USNM.

Hyperaspis oregona borealis Dobzhansky, 1941:76.

Comparison.- Distinguished from other North American Hyperaspis species by: general habitus and maculation (Fig. 20); size (TL 2.1-2.5 mm); range in western North "Sonoma County, California." Type in USNM.

Description.- Habitus and maculation as in Fig. 20. Body elongate oval, oblong. Color: head black; antennae light brownish-yellow, mouthparts brown; pronotum mostly black, lateral margins narrowly bordered yellow; elytra mostly black, maculation orange-yellow; each elytron with narrow marginal vitta, extended from base for 4/5th of length; subapical spot oval; discal vitta narrow and abbreviated, only in posterior 1/2 of elytron; ventral surface and legs piceous to dark brown, tarsi and tibiae light brownish-yellow. Abdomen: metacoxal arcs complete, subparallel with sternal margin.

Variation.- Size: TL 2.1-2.5 mm; W 1.5-1.7 mm. Males with frons and anterior margin of pronotum orange-yellow.

Distribution.- Western North America, Fig. 115. Recorded from: southern Alberta, southern British Columbia, Idaho, Montana, Oregon, Washington, and Wyoming.

Collecting and natural history notes.- Habitat: collected in southern Alberta and British Columbia. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 7.

3.11.9 _Hyperaspis_ _lanei_ Hatch.

Hyperaspis _lanei_ Hatch, 1962:159. Type locality: "Bead Lake, Washington." Type in WUSP.

Comparison.- Distinguished from other North American _Hyperaspis_ species by combination of characters: general habitus and maculation (Fig. 26); size (TL 2.0-2.5 mm); range in western North America (Fig. 117).

Description.- Habitus and maculation as in Fig. 26. Body elongate oval, oblong. Color: head black, except antennae and mouthparts; sexually dimorphic; pronotum and elytra mostly black, bordered with lateral yellow margins in both sexes; elytra maculate with abbreviated, relatively narrow marginal vitta for basal 2/3 to 4/5; wider posteriorly; apical spot small, transversely oval; ventral surface and legs black, except tibiae brown, tarsi and epipleura orange-brown. Vestiture: normal for genus. Sculpture: head finely punctate, shagreened; pronotum and elytra more distinctly punctate, without isodiametric meshes between punctures, shiny; punctures of elytra more irregular, unevenly spaced.

Variation.- Size: TL 2.0-2.5 mm; W 1.7 mm. Color: sexually dimorphic - female with head black, male with head yellow, black at vertex.

Distribution.- Western North America, Fig. 117. Recorded from: southern British Columbia, Idaho, and Washington.

Collecting and natural history notes.- Habitat: xeric savanna, sagebrush communities. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 10.

3.11.10 _Hyperaspis_ _dissoluta_ Crotch

Hyperaspis _dissoluta_ Crotch, 1873:379. Type locality: none given.

Hyperaspis _coloradana_ Casey, 1908:417. Type locality: Boulder, Colorado. Type in USNM. Synonymized by Dobzhansky, 1941:59.

Comparison.- Distinguished from other North American

Hyperaspis species by: general habitus and maculation (Fig. 15); size (TL 2.2-3.0 mm); range in western North America (Fig. 118); and details of male genital armature (figured by Dobzhansky, 1941).

Description.- Habitus and maculation as in Fig. 15. Body oval, convex. Color: head black, frons orange-yellow; eyes with greenish-blue lustre; antennae and mouthparts light brownish-yellow; pronotum mostly black, anterior angles and margin narrowly yellow; elytra mostly black, maculation orange-yellow; each elytron with marginal vitta for basal 2/3; subapical spot elongate oval; ventral surface black; front legs, tibiae and tarsi of middle and hind legs orange-yellow. Sculpture: dorsal surface distinctly punctate, polished; lateral margins of elytraargins narrowly reflexed. Abdomen: metacoxal arcs complete, subparallel with sternal margin.

Variation.- Size: TL 2.2-3.0 mm; W 1.6-2.2 mm.

Distribution.- Western North America, Fig. 118. Recorded from: Arizona, British Columbia, California, Colorado, Idaho, Montana, Nevada, Oregon, Texas, and Washington.

Collecting and natural history notes.- Collected in southern British Columbia only. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 14.

3.11.11 Hyperaspis simulatrix Dobzhansky

Hyperaspis simulatrix Dobzhansky, 1941:72. Type locality: " Oakley, Idaho." Type in USNM (54216).

Comparison.- Specimens of this species resemble those of H. lugubris (Randall), which are on average larger, and H. quadrioculata (Motschulsky), Californian species.

Description.- Habitus and maculation as in Fig. 27. Body elongate oval, convex. Color: head black, frons orange-yellow, vertex black; pronotum mostly black, lateral margins orange-yellow; elytra mostly black, maculate with orange-yellow spots; each elytron with elongate oval discal spot, and transverse subapical spot, lateral margin with orange-yellow vitta for basal 3/5th; ventral surface and legs brown-black, except femora and tarsi light brownish-yellow; Abdomen: metacoxal arcs complete. Legs: tarsal claws appendiculate.

Variation.- Size: TL 2.2-2.5 mm; W 1.6-1.8 mm. Color: head black in females.

Distribution.- Western North America, Fig. 116. Recorded from: southern Alberta, southern British Columbia, Idaho, Montana, Oregon, Saskatchewan, Utah, and Washington.

Collecting and natural history notes.- Habitat: collected from Artemisia plants during June-July in southern Alberta. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 8.

3.11.12 Hyperaspis lugubris (Randall)

Coccinella lugubris Randall, 1838:52. Type locality: "Massachusetts." Type not studied.

Hyperaspis venustula Mulsant, 1850:671. Type locality: "l' Amerique boreale." Type not studied. Synonymized by Dobzhansky, 1941:21.

Hyperaspis jucunda LeConte, 1852:134. Type locality: "Illinois." Type not studied. Preoccupied by H. jucunda Dejean, 1836:459. Nomen nudum.

Hyperaspis lecontii Crotch, 1874:233. Unnecessary replacement name for H. jucunda LeConte, 1852.

Hyperaspis separata Casey, 1924:165. Type locality: "Natick, Massachusetts." Type in USNM. Synonymized by Dobzhansky, 1941:21.

Comparison.- Distinguished from other North American Hyperaspis species by: general habitus and maculation (Fig. 29); size (TL 2.3-3.3 mm); wide distribution range in southern half of North America (Fig. 119); details of male genital armature (figured by Dobzhansky, 1941).

Description.- Habitus and maculation as in Fig. 30. Body elongate oval, convex. Color: head orange-yellow; pronotum: orange yellow in males, black with orange-yellow lateral margins in females; elytra mostly black, maculate with orange-yellow spots and vittae; each elytron with median, elongate oval orange-yellow spot; round apical spot; marginal vitta for 2/3 of length, expanded posteriorly; mouthparts and legs rufous. Male genitalia (figured by Dobzhansky, 1941).

Variation.- Size: TL 2.3-3.3 mm; W 1.6-2.4 mm. Coloration of pronotum varies to some extent in both males and females. Some males with posterior part and middle darker to brown. Females with anterior margin narrowly yellow.

Distribution.- Widely ranging in North America, Fig. 119. Recorded from: southern Alberta, southern British Columbia, California, Colorado, Idaho, Illinois, Indiana, Iowa, Kansas, Massachusetts, Michigan, Montana, New Jersey, New York, North Dakota, southern Saskatchewan, South Dakota, Texas, and Wisconsin.

Collecting and natural history notes.- Habitat: grassland, savannas and parkland. In the study area collected in southern Alberta and British Columbia only. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 18.

3.11.13 *Hyperaspis jasperensis*, new species

Hyperaspis jasperensis, new species. Type locality: Canada, Alberta, Jasper National Park, Bald Hils (53°43'N, 117°41'W). Holotype: male, labelled "Holotype (red border, circular label); CANADA, Alberta, Jasper National Park, Bald Hills. P. Kuchar, collector." Deposited in CNC. Paratypes: 5 males, 4 females; labelled "Paratype" (yellow border, circular label), other data as for holotype. To be deposited in (USNM, CAS, FMNH, CUNY, and WSUP).

Derivation of specific epithet.- Named in reference to the type locality - Jasper National Park.

Comparison.- Distinguished from other North American *Hyperaspis* species by: immaculate, brown-black elytra and restricted range in Northern Rocky Mountains (Fig. 119).

Description.- Habitus and maculation as in Fig. 28. Superficially similar to *Hyperaspidius arcuatus*, (Fig. 16). Body elongate oval, oblong. Color: dorsal surface brown-black, except orange-brown lateral and anterior pronotal margin, and humeral angles of each elytron; mouthparts brown; antennae yellow; ventral surface brown-black, except tarsi yellowish-brown. Vestiture: normal for genus. Sculpture: dorsal surface distinctly punctate, punctures shallow, without isodiametric meshes; ventral surface distinctly punctate, punctures large. Head: normal for genus; labium (Fig. 191). Legs: normal, tarsal claws simple (Fig. 190). Male genital armature (Figs. 171A, 171B, 171C): Female genitalia (Fig. 171D): spermatheca retort-shaped.

Note on relationships.- This species is a member of _H. annexa_ group of Dobzhansky (1941). This is based on autapomorphic structural characters shared by the members of this group, _e.g._, structure of male genital armature, (shape of median lobe).

Variation: Size: TL 1.5 mm; W 0.8 mm.

Distribution.- Alpine zone of the Northern Rocky Mountains. Recorded from the type locality only.

Collecting and natural history notes.- Habitat: alpine tundra, _i. e._ barren ridge of shale (7,600 ft; 2,316 m); windswept _Dryas_ tundra (7,400 ft; 2,255 m); and also east facing slope with diverse vegetation, notably _Anemone occidentalis_, _Artemisia norvegica_, grasses and sedges (7,300 ft; 2,225 m); Peter Kuchar, _in litteris_.

Species not studied.- The following species, specimens of which I did not see from the study area, were reported or are expected in southern Alberta or British Columbia. These are: _Hyperaspis levrati_ Mulsant, _H. annexa_ LeConte.

3.12 Genus _Brachiacantha_ Dejean

Brachiacantha Dejean, 1836:458. Type-species: Coccinella dentipes Fabricius, 1801:381. Subsequently designated by Crotch, 1874:210.

Brachyacantha Chevrolat, 1842:705. Unjustified emendation.

Derivation of name.- From Greek, brachys+akantha = short+thorn, in reference to spinose front tibiae. First used by Dejean (1836), who credited its origin to Chevrolat. Dejean's spelling Brachiacantha was unjustifiably emended by Chevrolat (1842). Subsequent authors used Chevrolat's (1842) spelling. According to the International Code for Zoological Nomenclature (Article 23): the valid name of a taxon is the oldest available name aplied to it, and (Article 56a): even if the difference between two genus-group names is due to only one letter, these two names are not to be considered homonyms. Therefore, I use Brachiacantha Dejean since it is the oldest available name for this genus. The North American members of this genus have been studied by Casey (1899, 1908); and Leng (1903, 1911).

Comparison.- Distinguished from other North American genera of Hyperaspini by: modified front tibiae, spinose at anterior edge (Fig. 176); tarsal claws appendiculate (Figs. 183, 184); eyes narrowly emarginate by post-antennal process.

Description.- Habitus and maculation as in Fig. 31. Body elongate oval, compact and prominently convex. Head: antennae of 11 articles each, terminal articles modified as in other Hyperaspini (Figs. 175, 177, 178); ultimate article of maxillary palpus securiform; eyes emarginate by postantennal process to some extent. Legs: relatively short and stout, retractile; tarsal formula 4-4-4, claws each with large basal plate, (Figs. 183, 184); front tibiae spinose anteriorly at basal 2/5; anterior edge grooved (Fig. 176). Abdomen. Six visible sterna in female, apparently seven in male (7th = tergum). Males only - 3rd, to 5th sterna modified; depressed at middle or variously bicuspid.

Variation.- Size: TL 1.6-6.0 mm; W 1.2-4.0 mm. The sexes distinguished by presence of VII apparent sterna (7th=tergum) in males, their modification in the last three; and in many species yellow-orange head in males as compared to black in females. The shape of front tibia, position of spine and other modifications thereof provide characters for identification of species. Color and pattern: elytral maculation polymorphic, varied in extent and melanism.

Distribution.- Panamerican genus with centre of diversity in Mexico and Central America. Ten species have been reported from South America, 19 from Mexico and Central America, and 18 from North America north of Mexico

(Leng, 1911). Only one species was recorded from the study area.

Natural history.- Larvae are inquilines in ant nests (Lasius sp.), and feed upon aphids and coccids carried by ants into their nests (Wheeler, 1911).

3.12.1 Brachiacantha ursina (Fabricius)

Coccinella ursina Fabricius, 1787:61. Type locality: "America boreali." Type not studied.

Coccinella albifrons Say, 1824:94. Type locality: "Missouri." Type lost. Synonymized by Wingo (1952:27).

Brachyacantha stellata Casey, 1899:117. Type locality: "Indiana." Type in USNM. NEW SYNONYMY.

Brachyacantha congruens Casey, 1899:117. Type locality: "Asheville, North Carolina." Type in USNM. NEW SYNONYMY.

Brachyacantha uteella Casey, 1908:413. Type locality: "Milford, Utah." Type in USNM. NEW SYNONYMY.

Brachyacantha sonorana Casey, 1908:413. Type locality: "Colonia Garcia, Chihuahua; Mexico." Type in USNM. NEW SYNONYMY.

Note on synonymy.- Upon examination of type specimens in Casey's collection (USNM), I consider these to be color, polymorphic variants of, and conspecific with B. ursina. This conclusion is based on presence of intermediate variants (melanic morphs) in this polymorphic species, and the same structure of male genital armature among different morphs.

Comparison.- This is the only species of Brachiacantha recorded from the study area. Distinguished from B. dentipes by smaller size and modification of front tibia (Fig. 176).

Description.- Habitus and maculation as in Fig. 31. Body elongate oval, compact, prominently convex. Color: head yellow-orange; vertex black; eyes with bluish-green lustre; antennae and mouthparts orange-yellow; pronotum mostly black, except anterior angles and margin maculate yellow-orange; elytra yellow-orange; suture narrowly pigmented black, stripe expanded posteriorly; each elytron with humeral and subapical black spot; confluent with each other and sutural stripe depending on degree of melanism; ventral surface and legs brown-black, except femora and tarsi light brownish-yellow. Legs: front femora modified, with anterior edge produced into sharp blade, toothed at proximal end; tarsal formula 4-4-4, claws appendiculate. Abdomen: metacoxal arcs complete.

Variation.- Size: TL 2.0-3.6 mm; W 2.0-2.5 mm. Polymorphic species. In melanic specimens, pronotum mostly black, except yellow-orange anterior angles; elytra black, each with five small, orange yellow spots (Fig. 31). Black pigmented spots may be confluent or missing entirely in some specimens. Degree of melanism could be clinal, but even the relatively small sample available for study, indicates that the melanic variants are predominant in most northern localities, except southern (xeric portion) of Alberta.

Distribution.- Widely ranging in North America, and Mexico, Fig. 120. Recorded from: Alabama, Alberta, Arizona, British Columbia, Colorado, Florida, Illinois, Indiana, Kansas, Louisiana, southern Manitoba, Michigan, Montana, Mexico, New Mexico, Ontario, Oregon, Pennsylvania, Quebec, Saskatchewan, South Carolina, South Dakota, Utah, Washington, Wisconsin, and Wyoming.

Collecting and natural history notes.- Habitat: Larvae are inquilines in nest of ants, Lasius claviger, (Roger) preying upon Pemhigus species domesticated by the ants (Schwarz, 1890). Adults in nests before dispersal. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 142.

3.13 Genus Chilocorus Leach

Chilocorus Leach, 1815:116. Type-species: Coccinella cacti Linnaeus, 1764:458. Subsequently designated by Hope, 1840:157.

Derivation of name.- Chilocorus, from Greek, cheilos+koros = lip (labrum)+ wide (expanded); in reference to laterally expanded clypeus.

Chilochorus Hope, 1840:157. Misspelling.

The North American species of this genus have been studied by Casey (1899), Leng (1903), Smith (1959, 1962, 1966). Chapin (1965) revised the tribe Chilocorini at generic level for the world.

Comparison.- Distinguished from other Chilocorini recorded from the study area by: antennae of eight articles; setose anterior angles of pronotum and beaded ridge extended from posterior angles along basal margin.

Description.- Chilocorini with body broadly oval, prominently convex. Head:, antennae of 8 articles each. Elytra: margins explanate but not reflexed, narrowly beaded, epipleura shallowly foveate. Legs: tibiae modified, spinose at basal 1/3; tibial spurs absent; tarsal formula 4-4-4, claws with quadrate basal tooth. Abdomen: metacoxal arcs incomplete.

Distribution.- World wide, genus with more than 50 species included. In North America represented by six described species.

Natural history.- Both larvae and adults are predaceous on Aphidae, Chermidae, and other homopterous insects.

3.13.0 Key to species

The following three species are separable only on basis of geographic ditribution ranges and chromosome numbers, (adopted and modified from Smith, 1959).

1 (0) Karyotype 2n=14 (southern Alberta and Saskatchewan).
........................*C. hexacyclus* Smith (13.3)

1' Karyotype 2n=19+.. 2

2 (1') Karyotype 2n=20 (interior British Columbia)........
........................*C. tricyclus* Smith (13.2)

2' Karyotype 2n=22+s (widely ranging)............
........................*C. stigma* (Say) (13.1)

3.13.1 Chilocorus stigma (Say)

Coccinella stigma Say, 1835:202. Type locality: None specified. "United States." Type lost.

Chilocorus bivulnerus Mulsant, 1850:460. Type locality: "l' Amerique du Nord." Type not studied. Synonymized by Casey, 1899.

Comparison.- Karyotype: 2n=22+s. Polymorphic (2n= 19-25) males, (2n= 20-26) females.

Description.- Habitus and maculation as in Fig. 33. Body short oval, prominently convex to subhemispherical. Color: head black; mouthparts brown-black, antennae light brownish-yellow; pronotum and elytra mostly black, except maculation orange-yellow; each elytron with circular, discal spot. Sculpture: dorsal surface distinctly punctate, polished; elytral punctures relatively large, unequal. Abdomen: metacoxal arcs incomplete, subparallel with sternal margin.

Variation.- Size: TL 4.4-5.0 mm; W 4.3 mm.

Distribution.- Restricted to east of Rocky Mountains and Sierra Nevada Mountains, (Fig. 124). Recorded from: Alabama, Alberta, Arizona, Arkansas, Colorado, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Manitoba, Michigan, Mississippi, Missouri, Montana, New Hampshire, New Mexico, New York, North

Carolina, North Dakota, Ohio, Ontario, Pennsylvania, Quebec, Saskatchewan, South Carolina, South Dakota, Tenessee, Utah, Virginia, West Virginia, Wisconsin, and Wyoming.

Collecting and natural history notes.- Habitat: parkland and forest, apparently associated with Adelges (Chermes) species, and conifers. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 132.

3.13.2 Chilocorus tricyclus Smith

Chilocorus tricyclus Smith, 1959:446. Type locality: "Grand Forks, British Columbia." Type in CNC.

Comparison.- Distinguished from other Chilocorus species cytologically. Karyotype: 2n=20. Meiotic formula - 3 ring II + 6 non-ring II; II + 1 neo-XY (male): XX (female) II.

Description.- Superficially indistinguishable from C. stigma and C. hexacyclus.

Variation.- Size: TL 4.4-5.0 mm; W 4.3 mm.

Distribution.- Northwestern North America, Fig. 122. Recorded from: West of Continental Divide, i.e., British Columbia and Washington.

Collecting and natural history notes.- Habitat: trees and shrubs in coniferous parkland and forests, feed on Phenacaspis pinifoliae (Fitch). For list of localities within the study area see Appendix "A".

Number of specimens examined.- 21.

3.13.3 Chilocorus hexacyclus Smith

Chilocorus hexacyclus Smith, 1959:446. Type locality: "Conquest, Saskatchewan." Type in CNC.

Comparison.- Distinguished from other North American Chilocorus species only on the basis of chromosomal count. Karyotype: 2n=14. Meiotic formula - 6 ring II + 1; neo-XY (male) : XX (female) II.

Description.- Superficially indistinguishable from two previous species C. stigma and C. tricyclus. Karyotype: two arms of each of 12 autosomes and X euchromatic, Y metacentric; not acrocentric and euchromatic as in C. tricyclus (Smith, 1962).

Variation.- Size: TL 4.4-5.0 mm; W 4.3 mm.

Distribution.- Northern North America, Fig. 123. Recorded from: southern Alberta and Saskatchewan only.

Collecting and natural history notes.- Habitat: For list of localities within the study area see Appendix "A".

Number of specimens examined.- 11.

3.14 Genus Exochomus Redtenbacher

Exochomus Redtenbacher, 1843:11. Type-species: Coccinella quadripustulata Linnaeus, 1758:367. Subsequently designated by Korschefsky, 1932:252. Designations of Coccinella tripustulata DeGeer, 1775:365; by Crotch (1873:376), and Coccinella nigromaculata Goeze, 1778:284; by Crotch (1874:192) are both invalid because these species were not among originally included species.

Derivation of name.- Exochomus, from Greek exochos and omos = standing out (prominent), and shoulder in reference to prominent humeral angle of elytra.

Comparison.- Distinguished from other North American Chilocorini by: antennae of 10 articles each, tarsal claws with subquadrate basal tooth each.

Description.- Chilocorini with body outline short oval to circular, moderately convex. Head: antennae of 10 articles each; mandibles simple at apex; terminal article of maxillary palpus subsecuriform; ultimate article of labial palpus cylindrical, twice as long as wide. Thorax: pronotum narrowly margined across base, lateral margins slightly reflexed; prosternal lobe narrow, truncate at apex, anterior coxae almost contiguous; legs with moderately stout femora, tibiae slender, tarsal formula 4-

4-4, claws with subquadrate basal tooth each. Elytra: margin distinctly beaded, epimera not foveate. Abdomen: metacoxal arcs complete or virtually so. Male genitalia (figured by Chapin, 1965): basal lobe slender, parallel in basal 2/3, slightly asymmetrical in apical 1/3; lateral lobes 1/8 longer than basal lobe; sipho arcuate slender, of even diameter throughout most of its length, apex twisted, siphonal capsule well developed.

Distribution.- World wide, genus with six species included (Chapin, 1965a).

3.14.1 Exochomus aethiops (Bland)

Coccinella aethiops Bland, 1864:72. Type locality: "Colorado." Type not studied.

Brumus aethiops: Korschefsky, 1931:265. Misidentification.

Exochomus mormonicus Casey, 1908:411. Type locality: "Marysvale, Utah." Type in USNM (35556). Synonymized by Gordon, 1974a:2.

Comparison.- Distinguished from other North American Chilocorini by combination of characters: tarsal claws appendiculate; antennae of 10 articles each. Specimens of E. aethiops (Bland) are the only Chilocorini known in the study area with the entire dorsal surface immaculate, black.

Description.- Body oval, prominently convex. Color: head black; pronotum mostly black, anterior margins faintly rufescent; elytra black, immaculate, except margins in some specimens brownish-black. Sculpture: microsculpture of pronotum and elytra finer than in other Chilocorini, punctures shallow and indistinct.

Variation.- Size: TL 2.9-4.0 mm; W 2.4-3.5 mm.

Distribution.- Western North America, Fig. 121. Recorded from: southern Alberta, Arizona, Colorado, Idaho, Kansas, Montana, Nebraska, New Mexico, Mexico, western Oregon, southern Saskatchewan, Utah, Washington, and Wyoming.

Collecting and natural history notes.- Habitat: For list of localities within the study area see Appendix "A".

Number of specimens examined.- 16.

3.15 Genus Brumoides Chapin

Brumoides Chapin, 1965a:237. Type-species: Coccinella suturalis Fabricius, 1798:78. Designated by Chapin, 1965a:237; original designation.

Derivation of name.- Origin unknown.

Comparison.- Distinguished from other Chilocorini recorded from the study area by: simple tarsal claws, and antennae of 8 articles each.

Description.- Chilocorini with body oval, moderately convex, upper surface glabrous. Head: atennae of 8 articles each; maxillary palpus with terminal article securiform; labial palpus slender, terminal article cylindrical; Elytra: margins distinctly explanate and reflexed. Legs: middle and hind tibiae with prominent spurs each; tarsal formula 4-4-4, claws simple. Abdomen: metacoxal arcs complete. Male genitalia (figured by Chapin, 1965a): basal lobe triangular; lateral lobes approximately twice longer than basal lobe.

Distribution.- World-wide, genus with nine species included (Chapin, 1965). In North America represented by two described species.

Natural history.- Both larvae and adults predaceous on Chermes piceae Ratz., and seem to be associated with conifers.

3.15.1 Brumoides septentrionis (Weise)

Brumus septentrionis Weise, 1885:230. Type locality: "Hudson's Bay." Type not studied.

Exochomus ovoideus Casey, 1899:107. Type locality: "? Indiana." Type in USNM. Synonymized by Gordon (1974a).

Exochomus parvicollis Casey, 1908:411. Type locality:

"St. George, Utah." Type in USNM. Synonymized by Gordon (1974a).

Comparison.- Some melanic specimens of this polymorphic species closely resemble those of _Exochomus californicus_ Casey, from which these can be separated by simple tarsal claws (appendiculate in _Exochomus_).

Description.- Habitus and maculation as in Fig. 34. Body broadly oval, prominently convex. Color: head black; pronotum mostly black; elytra orange-yellow, maculate with black spots, elytral margin narrowly pigmented black; each elytron with two spots, and sutural band, expanded at apices; ventral surface and legs brown to black. Abdomen: metacoxal arcs complete. Tarsal claws simple.

Variation.- Size: TL 3.5-4.5 mm; W 2.0-2.7 mm. Color and maculation: size of black spots on elytra varied; from indistinct to large and confluent; sutural band from narrow narrow to wide and confluent with spots. In most extreme case of melanism, spots confluent to cover the elytra almost entirely, except for humeral margin and subapical spot on each elytron.

Distribution.- Widely ranging in North America, Fig. 125. Recorded from: Alabama, Alberta, Arizona, Arkansas, British Columbia, California, Colorado, Idaho, Illinois, Indiana, Manitoba, Montana, Nevada, New Mexico, New Jersey, New York, Oregon, Pennsylvania, Saskatchewan, Texas, Utah, Washington, and Wyoming.

Collecting and natural history notes.- Habitat: collected from Picea glauca infested with Adelges (Chermes) piceae Ratz. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 175.

3.16 Genus Coccidula Kugelann

Coccidula Kugelann, 1798:421. Type-species: Chrysomela scutellata Herbst, 1783:58. Subsequently designated by Crotch, 1874:300. The designation of Dermestes rufus Herbst, 1783:22; by Korschefsky, 1931:81 is invalid.

Strongylus Panzer, 1813:114. Preoccupied.

Cacidula Curtis, 1826. Misspelling.

Cacicula Stephens, 1828:319. Misspelling.

Derivation of name.- Coccidula - a coccid eater; in reference to feeding habits.

Comparison.- Eye facets much larger than in other group of North American coccinellids; front coxal cavities open posteriorly.

Description.- Distinguished from other North American Coccinellidae by: Coccidulini of medium size (3.0 mm). Body elongate, oblong. Color: head black, pronotum and elytra orange yellow, maculation black; antennae and mouthparts orange-yellow; ventral surface - basisternum black (in some specimens also sternum III blackish); legs orange-yellow. Vestiture: dorsal surface pubescent, ventral surface and legs setose. Sculpture: head and pronotum distinctly punctate, shiny; elytra coarsely pucntate, punctures large, unequal and coalescent. Head: eyes relatively small, coarsely faceted; antennae of 11 articles each, moderately long, clavate; mandibles bifid at apex; maxillary palpus of 3 articles each, ultimate article conical. Thorax: lateral margin of pronotum narrowly reflexed. Elytra: margins narrowly reflexed; epipleura not foveate. Legs: tarsal formula 4-4-4; claws appendiculate. Abdomen: metacoxal arcs complete, semicircular.

Distribution.- Holarctic Region, genus with five included species. Two species recorded from North America, and one from Mexico.

3.16.1 Coccidula occidentalis Horn

Coccidula occidentalis Horn, 1895:114. Type locality: None speciefied.- "Wyoming to Vancouver." Here restricted to British Columbia.

Coccidula lepida var. suturalis Weise, 1895:132. Type locality: "Ohio." NEW SYNONYMY.

Note on nomenclature.- Both names, *C. occidentalis* Horn and *C. suturalis* Weise, were published in the same year (1895). This led some authors to place *C. occidentalis* Horn as a synonym of *C. suturalis* Weise. But since *C. suturalis* was proposed only as a subspecific epithet for a varietal form of *C. lepida* LeConte, and *C. occidentalis* was fully described and illustrated as a new species, I use Horn's name for this species.

Comparison.- Distinguished from *C. lepida* by: elytral maculation (discal spot on elytra joined with scutellar spot), and range in western North America (Fig. 126).

Description.- Habitus and maculation as in Fig. 35. Oblong, subdepressed, finely pubescent. Color: dorsum yellowish red, except head and elytral maculation; ventral surface black, except yellow last three sterna and legs. Sculpture: head sparsely punctate; pronotum more closely punctate; elytra much more coarsely punctate.

Variation.- Size: TL 3.0-3.5 mm; W 1.4 mm.

Distribution.- Widely ranging in northern North America, Fig. 126. Recorded from: Alaska, Alberta, British Columbia, Colorado, Idaho, Illinois, Minnesota, Montana, Northwest Territories, Ohio, Saskatchewan, Wisconsin, and Yukon.

Collecting and natural history notes.- Habitat: A number of specimens were obtained sifting through forest litter and from pitfall traps. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 57.

3.17 Genus Anatis Mulsant

Anatis Mulsant, 1846:133. Type-species: Coccinella ocellata Linnaeus, 1758:366. Designated by Mulsant, 1846:133; through monotypy.

Myzia LeConte, 1852:130, 132. (In part).

Derivation of name.- From Greek, anatos = harmless, in reference to feeding habits (beneficial, aphidophagous).

The North American species of this genus have been studied by: LeConte (1852); Casey (1899); McKenzie (1936); Timberlake (1943); Watson (1956).

Comparison.- Distinguished from other North American Coccinellini by: large size (TL 6.0 - 10.8 mm); body broadly oval in outline, markedly convex; tarsal claws, each with large basal plate.

Description.- Habitus and maculation as in Figs. 36, 37, 38. Body short oval, markedly convex to subhemispherical. Color: head black with two interocular yellowish-white spots; antennae and mouthparts fulvous; pronotum mostly black, except for white discal mark, varied from species to species; elytra from ivory-white to deep mahogany brown, maculate with series of black dots, or only margin narrowly black, each elytron with humeral and scutellar spot, and two rows of three to four spots; ventral surface and legs brown-black, except in *A. mali* with sterna laterally and tibiae orange-brown. Vestiture: dorsal surface glabrous, except setose head and apex of elytra; ventral surface and legs setose. Sculpture: head distinctly punctate, shagreened; pronotum finely punctate, shagreened; elytra punctate, punctation varied. Head: quadrate in dorsal aspect, bisinuate posteriorly; eyes prominent. Elytra: broadly rounded in outline to almost angulate in middle; margins narrowly explanate. Legs: normal for Coccinellini, tarsal claws with large basal tooth. Male genitalia (Figs. 172A, 172B, 172C): sipho elongate, arcuate tube; siphonal capsule well developed; lateral lobes shorter or equal in length with basal lobe, setigerous distally; basal lobe constricted to blunt point at apex; trabes paddle shaped. Female genitalia (Fig. 172D): spermatheca slender, semicircular cylinder; infundibulum well developed.

Distribution.- Members of this genus are known from the entire Holarctic region. In North America, the distribution range extends southwards to northernmost Mexico. *A. mali* (Say) reaches Cuba.

3.17.0 Key to species

1 (0) Pronotum mostly black, anterior margin pigmented

black. Elytra deep mahogany brown, immaculate except lateral margins narrowly bordered black. Western North America, Rocky Mountains ....*A*. *lecontei* Casey (17.1)

1' Pronotum mostly black, maculate with M-shaped yellowish-white mark, anterior margin not pigmented black, narrowly yellowish-white. Elytra maculate with black spots. 2

2 (1') Lateral margin of elytra bordered black, distinctly angulate at 2/3 in dorsal aspect. Western North America, Pacific seaboard, Columbia Plateau, parts of Rocky Mountains ....*A*. *rathvoni* (LeConte) (17.2)

2' Elytra not distinctly angulate laterally, margin not bordered by narrow black stripe, reduced to single spot 3

3 (2') Elytra maculate with black spots. Spots on each elytron ocellate (encircled by yellowish-white ring). Ventral surface and legs uniformly dark brown. Widely ranging in northern half of North America ....*A*. *borealis*, n. sp. (17.3)

3' Elytra ivory-yellow, maculate with black spots. Spots not ocellate. Tibiae and tarsi yellowish-orange, femora dark brown. Eastern half of North America, Atlantic seaboard, and Cuba ....*A*. *mali* (Say)

3.17.1 Anatis lecontei Casey

Anatis lecontei Casey, 1899:98. Type locality: New Mexico, Fort Wingate. Type in USNM.

Anatis rathvoni lecontei: Leng, 1903:208.

Comparison.- Distinguished from other North American Anatis species by immaculate elytra, except lateral margin narrowly bordered black.

Description.- Habitus and maculation as in Fig. 37. Body ovoid, prominently convex to hemispherical. Color: head black, frons with two, white interocular spots; mouthparts brown to black, antennae light brownish-yellow; pronotum mostly black, maculate with two yellow-white stripes, convergent anteriorly (Fig. 37); and two, yellow-white spots at base. elytra dark mahogany brown, margins narrowly bordered black; ventral surface and legs black.

Variation.- Size: TL 6.0-10.2 mm; W 7.5-8.7 mm. The white, basal spots on pronotum varied in size, in some specimens greatly reduced or missing. Johnson (1910:74) noted variability of the two pronotal white spots, and the width of the lateral stripe.

Distribution.- Western North America, Fig. 127. Recorded from: southern Alberta, southern British Columbia, California, Colorado, Idaho, New Mexico, Oregon, Utah, Wahington, and Wyoming.

Collecting and natural history notes.- Habitat: parkland, savannas and coniferous forests. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 126.

3.17.2 Anatis rathvoni (LeConte)

Myzia rathvoni LeConte, 1852:132. Type locality: "Sacramento, California." Type in MCZ.

Anatis rhatvoni: Malkin, 1943:198. Misspelling.

Comparison.- Specimens of this species are distinguished from other North American Anatis species by: markedly angulate lateral margin of elytra (Fig. 38); margin pigmented narrowly black, thickened at point of angulation; elytra maculate with black spots (Fig. 38); geographic distribution range in western, coastal North America, Columbia Plateau, and parts of the Rocky Mountains (Fig. 129).

Description.- Habitus and maculation as in Fig. 38. Body ovoid, prominently convex to subhemispherical. Color: head black, with two interocular white spots; pronotum mostly black, dark area M-shaped; elytra brown-beige, lateral margin narrowly bordered black; maculate with black spots, in some specimens ocellate; each elytron with 6 spots, arranged in two rows (Fig. 38).

Variation.- Size: TL 5.5-10.5 mm; W 5.0-7.0 mm. Johnson (1910:74) noted that elytral maculation is in some specimens very indistinctive, or spots absent. On the other hand, some specimens show faintly ocellate and very prominent elytral spots. Hatch (1962) reported variation in less than 3% of 122 specimens examined.

Distribution.- West of the Rocky Mountains, Fig. 129. Recorded from: southern Alberta, southern British Columbia, California, Idaho, Oregon, and Washington.

Collecting and natural history notes.- Habitat: on coniferous trees and shrubs, infested with Adelges (Chermes) species. The only Alberta specimen is from the shore of Waterton Lake (washup). It is, most probably, a wind blown-in stray. British Columbia collection localities are numerous but restricted to the southern portion of province. Specimens have been collected from sea level to 2743 m (9,000 ft) on Mt. Eddy in California. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 131.

3.17.3 Anatis borealis, new species

Anatis ocellata: of North American authors. Not Linnaeus, 1758:366.

Coccinella mali "var. a" Say, 1824:93. Informal designation. Type locality not given. Type lost.

Coccinella labiculata "var. a" Say, 1835:192. Informal designation. Type locality not given. Type lost.

Anatis 15-punctata: Provancher, 1877:696. Misidentification. Not Degeer, 1775:376.

Note on nomenclature.- LeConte (1883:232, 192), indicated that both Says' descriptions were based on specimens of A. mali, a species restricted to the southeastern half of North America. Specimens of A. borealis which were in both instances involved, were informally designated as "var. a". Earlier, LeConte (1854:132) included species of the genus Anatis in by him redefined genus Myzia, and regarded this species described by Say (1824, 1835) to be conspecific with C. 15-punctata Degeer (=A. ocellata (Linnaeus)). Because Say's types are lost, and informal designation of specimens which might have served as types, no previous name is available for this species.

Anatis borealis, new species. Type locality: Edmonton, Alberta. Holotype: male, labelled - Holotype (red border, circular label). "CAN. Alberta, Edmonton. 25.VII.1971. J. Belicek, coll." Deposited in CNC. Paratypes: six males, labelled - Paratype (yellow border, circular label). "CAN. Alberta, Edmonton. 25.VII.1971." Deposited in (USNM, CAS, FMNH, CUNY, UASM).

Derivation of specific epithet.- Named in reference to the distribution range of this species.

Comparison.- Distinguished from other North American Anatis species by: ocellate spots on elytra, concolorous femora and tibiae, and range in northern half of the North America (Fig. 128).

Description.- Habitus and maculation as in Fig. 36. Body ovoid, prominently convex. Color: head black, with two large, white, interocular spots; mouthparts brownish-black, antennae light brownish-yellow; pronotum mostly black, white maculation pattern as in Fig. 36; each elytron with 9 black, ocellate spots, arranged in three, transverse rows (Fig. 36), apices maculate with small, yellowish spots; ventral surface and legs light brown to dark brown, except femora darker at tibial joint. Abdomen: male genital armature (Figs. 172A, 172B, 172C); median lobe slender, arcuate tube, siphonal capsule well developed; basal lobe symmetrical, equal in length with lateral lobes. Female genital armature (Fig. 172D): spermatheca slender, arcuate cylinder.

Note on relationships.- This species is most closely related to the Palaearctic, A. ocellata, based on the autapomorphic characters (ocellate spots on elytra, concolorous legs) unique to members of these two species.

Variation.- Size: TL 6.0-9.0 mm; W 5.5-7.0 mm.

Distribution.- Northern half of North America, Fig. 128. Recorded from: Alaska, Alberta, British Columbia, Idaho, Illinois, Indiana, Kansas, Maine, Manitoba, Michigan, Minnesota, Montana, New York, North Dakota, Northwest Territories, Ontario, Oregon, Quebec, Saskatchewan, South Dakota, Washington, Wisconsin, and Yukon.

Collecting and natural history notes.- Habitat: parkland and forest. For list of localities within the study area see Appendix "A". Hosts: Chermes pinicorticis Fitch, on Pinus; Chaitophorus aceris Linnaeus, on Populus norvegica; (Felt, 1906).

Number of specimens examined.- 148.

3.18 Genus Myzia LeConte

Mysia Mulsant, 1846:129. Not Lamarck, 1818.

Myzia Mulsant, 1846:227, (index). Type-species: Coccinella oblongoguttata Linnaeus, 1758:367. Designated by: Mulsant, 1846:129; through monotypy.

Myzia LeConte, 1852:130. Validation of Mulsants' alternate spelling. If in original publication, a given name has been spelled in more than one way, the spelling adopted by the first reviser is to be accepted as correct (Article 32b, of the International Code of Zoological

Nomenclature).

Neomysia Casey, 1899:98. Type-species: Coccinella pullata Say, 1825:301. Here designated. NEW SYNONYMY.

Paramysia Reitter, 1911:136. Unnecessary replacement name. Type species: Coccinella oblongoguttata Linnaeus, 1758:367, since Article 67(i) of the International Code of Zoological Nomenclature states that replacement names of the genus-group taxa must have the same type-species as the original one.

Note on synonymy.- C. oblongoguttata and C. pullata are, congeneric taxa, based on synapomorphic characters, e.g., size, color, and maculation which separate members of this genus from other Coccinellini, and autapomorphous characters, e.g., structure of male genitalia, confined to members of this group. Thus, Neomysia is a junior synonym of Myzia.

Note on nomenclature.- Myzia LeConte (1852) is a replacement name for Mysia Mulsant, which is a junior homonym of Mysia Lamarck, 1818 (Mollusca). Casey (1899) erected a new genus, Neomysia, said not to be congeneric with Mulsants' genus Mysia. In 1924, Casey changed his opinion and stated that his name Neomysia is a replacement name for preoccupied Mulsants' name. However, Reitter (1911) already proposed another name for Mulsants' taxon, being unaware of LeContes' action in 1852. Thus Paramysia of Reitter, and Neomysia Casey are both junior synonyms of Myzia as validated by LeConte (1852).

Comparison.- Distinguished from other North American Coccinellini by combination of characters: large size (6.0-10.0 mm); elytral maculation (longitudinal vittae).

Description.- Coccinellini of large size (6.0-10.0 mm). Body ovoid, prominently convex to subhemispherical. Color: head brown-black, frons with interocular pale marks. pronotum and elytra ochreous-yellow to beige, maculate with light brown to black spots and vittae; ventral surface brown to black, except legs in some species light brown to orange-brown. Sculpture: dorsal surface finely punctate, polished, shiny. Head: eyes finely faceted, emarginate; antennae of 11 articles each, moderately long, clavate; mandibles bifid at apex; maxillary palpus of 3 articles each, ultimate article securiform. Thorax: pronotum trapezoidal, lateral margins rounded, anterior margin recessed above eyes. Elytra: lateral margins narrowly explanate, epipleura not foveate. Legs: normal, tarsal formula 4-4-4, claws appendiculate, distinctly cleft. Abdomen: metacoxal arcs incomplete.

Distribution.- Holarctic Region. One species was described from the Palaearctic Region (M. oblongoguttata (Linnaeus), three from North America, and one from Mexico.

Natural history.- Both adults and larvae are predaceous on aphids and chermids associated with conifers. Also found on deciduous trees and shrubs infested with aphids.

3.18.0 Key to species

1 (0) Pronotum with distinct black mark 2
Pronotum with obscure, light-brown mark..........
..........................*M*. *horni* (Crotch) (18.3)
2 (1) Lateral white margin of pronotum maculate with black spot ....*M*. *pullata* (Say) (18.2)
Lateral white margin of pronotum without black spot
......................*M*. *subvittata* (Mulsant) (18.1)

3.18.1 *Myzia subvittata* (Mulsant)

Mysia subvittata Mulsant, 1850:139. Type locality: "les parties occidentales de l'Amerique du Nord." Type not studied.

Neomysia oregona Casey, 1924:160. Type locality: "Bull Run, Clackamas Co., Oregon." Type in USNM.

Comparison.- Specimens of *M*. *subvittata* are more convex than similarly maculate, western specimens of *M*. *pullata*. Legs of the latter species are brown-black as compared to rufo-light brown in *M*. *subvittata*. Pronotal black spot in white lateral stripe, characteristic of *M*. *pullata* east of the Rocky Mountains, is reduced or missing in some British Columbia specimens.

Description.- Habitus and maculation as in Fig. 39. Body ovoid, prominently convex, subhemispherical. Color: head yellow, vertex with black, triangular mark; mouthparts and antennae light brownish-yellow; pronotum cream-yellow, pronotal maculation distinct, brown-black trapezoidal mark, in some specimens divided medially; elytra cream-yellow, shiny; maculate with brown-black, three longitudinal vittae on each elytron (Fig. 39); lateral vitta narrow, median interrupted and joined laterally to sutural vitta, suture narrowly pigmented brown; ventral surface and legs rufo-light brown.

Variation.- Size: TL 7.5-8.0 mm; W 5.0-5.8 mm. Pigmentation: elytral maculation in some western specimens indistinct (Oregon, California).

Distribution.- Western North America, Fig. 130. Recorded from: southern Alberta, southern British Columbia, California, Idaho, Oregon, Utah, and Washington.

Collecting and natural history notes.- Habitat: coastal chapparal communities, parkland. The two localities (Banff and Waterton) in Alberta from which specimens were seen are records probably of incidental strays. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 121.

3.18.2 *Myzia pullata* (Say)

Coccinella pullata Say, 1825:301. Type locality: None specified. " Eastern coast of Virginia, and Florida." Type lost.

Coccinella notans Randall, 1838a:49. Type locality: "Maine." Synonymized by Mulsant, 1850:1023.

Neomysia randalli Casey, 1899:99. Type locality: "Lake Superior." Type in USNM. NEW SYNONYMY.

Neomysia montana Casey, 1899:100. Type locality: "Colorado." Type in USNM. NEW SYNONYMY.

Note on synonymy.- Upon examination of type specimens in Casey's collection (USNM), I consider these to be color variants, and conspecific with *M. pullata*. This conclusion is based on: the autapomorphic structure of the male genital armature among the different color variants in *M. pullata* complex; existence of intermediate color variants (maculation) among specimens from vicariant populations.

Comparison.- Specimens of this species can be distinguished from other species in this genus on basis of pronotal maculation. The median trapezoidal mark is extended laterally into the white margin of pronotum, in comma-like projection, which in some specimens may be reduced to separate dot.

Description.- Habitus and maculation as in Fig. 41. Broadly oval, prominently convex. Color: frons with large, trapezoidal black mark between eyes, separating yellowish-white, interocular spots; labrum brown to black; pronotum with median trapezoidal mark, in some specimens medially divided; other maculation as given in comparison above; elytra from ochreous to brown, maculate or not, in maculate specimens, maculation varied, of 3 interrupted or variously confluent longitudinal vittae on each elytron; ventral surface and legs brown to black.

Variation.- Size: TL 6.4-7.2 mm; W 4.9-5.5 mm. Maculation of pronotum and elytra varied in extent and intensity. Generally, more melanic specimens with brown-black vittae were recorded from northern regions or from higher elevations.

Distribution.- Widely ranging in North America east of Rocky Mountains and Sierra Nevada Mountains, Fig. 132. Recorded from: Alberta, Illinois, Indiana, Iowa, Kansas, Labrador, Manitoba, Michigan, Minnesota, Missouri, New Brunswick, New Jersey, New York, Ohio, Ontario, Pennsylvania, Quebec, Saskatchewan, Tennessee, Texas, Wisconsin, and Yukon.

Collecting and natural history notes.- Habitat: coniferous trees and shrubs, infested with aphids and scale insects (Lecanium species). Often, after sudden storms, a large number of specimens can be obtained from wash-up debris on shores of larger lakes. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 156.

3.18.3 Myzia horni (Crotch)

Mysia hornii Crotch, 1873:375. Type locality: "Oregon." Type not studied.

Neomysia interrupta Casey, 1899:99. Type locality: "Fort Wingate, New Mexico." Type in USNM. NEW SYNONYMY.

Comparison.- Specimens of this species distinguished from other species in this genus by: indistinct pronotal maculation; elytral maculation - inner discal vitta extended posteriorly and joined to median vitta; distribution range in western North America (Fig. 131).

Description.- Habitus and maculation as in Fig. 40. Large sized Coccinellini; body ovoid, prominently convex, subhemispherical. Color: head yellow, pronotum ochreous-yellow, maculate with light brown; indistinct, M-shaped mark; elytra ochreous-yellow, maculate with light brown vittae; each elytron with three longitudinal vittae, convergent posteriorly, marginal two interrupted at basal 1/5, suture and margin narrowly pigmented brown; ventral surface and legs reddish-light brown.

Variation.- Size: TL 6.7-8.0 mm; W 5.4-6.0 mm. Maculation variously distinct.

Distribution.- Western North America, Fig. 131.

3

Recorded from: Alberta, Arizona, British Columbia, Idaho, Montana, Nebraska, New Mexico, Oregon, Texas, Washington.

Collecting and natural history notes.- Habitat: coniferous parkland and forest. Records from British Columbia are numerous, particularly from the southern portion of the province. The only Alberta record is from Medicine Hat, and this is most likely an imported specimen, or wind-blown stray. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 137.

3.19 Genus Calvia Mulsant

Calvia Mulsant, 1846:140. Type-species: Coccinella decemguttata Linnaeus, 1767:583. Subsequently designated by Crotch, 1874:143. The designation of Coccinella quatuordecimguttata Linnaeus, 1758:367; by Korschefsky (1932:520) is invalid.

Anisocalvia Crotch, 1873:364, 373. Type-species: Coccinella quatuordecimguttata Linnaeus, 1758:367. Subsequently designated by Crotch, 1874:143. NEW STATUS. See Bělíček (1976), and in litteris.

Comparison.- Distinguished from other North American Coccinellini by absence of isodiametric meshes between punctures on pronotum (Fig. 81).

Description.- Coccinellini of medium size (TL 4.0-6.0 mm). Body oval, prominently convex. Color: varied, maculation pattern (Figs. 42a, 42b); polymorphic species. Head: eyes emarginate, finely faceted; antennae of 11 articles each, moderately long, clavate, scape enlarged; mandibles bifid at apex; maxilary palpus securiform. Thorax: pronotum recessed above eyes, slightly explanate laterally. Elytra: margins narrowly reflexed; epipleura not foveate. Abdomen: with 6 visible sterna. Metacoxal arcs incomplete. Tarsal claws appendiculate.

Distribution.- Holarctic region.

Natural history.- Both larvae and adults are predaceous on aphids, scale insects and other soft bodied insects.

3.19.1 Calvia (Anisocalvia) quatuordecimguttata (Linnaeus)

Coccinella 14-guttata Linnaeus, 1758:367. Type locality: Lappland. Type in BMNH, not studied.

Coccinella duodecimmaculata Gebler, 1832:76. Type locality: "Siberia". Type not studied. Synonymized by Crotch, 1874:33.

Coccinella incarnata Kirby, 1837:231. Type locality: "60° N." Type not studied. Synonymized by Casey, 1899.

Coccinella cardisce Randall, 1838a:32. Type locality:

"Maine." Type lost. Synonymized by Casey, 1899:96.

Coccinella obliqua Randall, 1838a:33. Type locality: "Maine." Type lost. Synonymized by Casey, 1899:96.

Coccinella similis Randall, 1838b:50. Type locality: "Maine." Type lost. Synonymized by Casey, 1899:96.

Anisocalvia victoriana Casey, 1899:96. Type locality: British Columbia. Type in USNM. NEW SYNONYMY.

Anisocalvia elliptica Casey, 1899:97. Type locality: "Hudson Bay". Type in USNM. NEW SYNONYMY.

Agrabia sicardi Nunenmacher, 1912:448. Type locality: "Hornbrook, Siskiyou Co., California." Type in CAS. Synonymized by Gordon, 1974.

Anisocalvia lacustris Casey, 1924:158. Type locality: "Marquette, Michigan." Type in USNM. NEW SYNONYMY.

Anisocalvia bicordifera Casey, 1924:159. Type locality: "Lake George, New York." Type in USNM. NEW SYNONYMY.

Anisocalvia vancouveri Casey, 1924:159. Type locality: "British Columbia." Type in USNM. NEW SYNONYMY.

Anisocalvia quadrisignata Casey, 1924:159. Type locality: "Marquette, Lake Superior." Type in USNM. NEW SYNONYMY.

Anisocalvia postplagiata Casey, 1924:159. Type locality: "Marquette, Lake Superior." Type in USNM. NEW SYNONYMY.

Anisocalvia uniformis Casey, 1924:160. Type locality: "Adirondack Mts., New York." Type in USNM. NEW SYNONYMY.

Note on synonymy.- Upon examination of type specimens in Casey's collection (USNM), I consider these to be color, polymorphic variants of, and conspecific with *C. quatuordecimguttata*. This conclusion is based on: the autapomorphous structure of male genitalia among the different morphs of this polymorphic complex; field observations of actual mating of individuals with different color patterns, and from analyses of color and patterns in more than 1,000 individuals from many localities throughout the range of this species. These analyses confirmed the existence of intermediates between seemingly distinct color morphs, and also it was established that the difference in background color, and superimposed spoting pattern results in optical illusion which tends to amplify the discontinuity between various morphs.

Comparison.- Specimens of this species are distinguishable from all other North American Coccinellini by reduced microsculpture of pronotum (Fig. 81), which as viewed under light microscope (50x) appears as smooth, shiny surface without any obvious reticulation.

Description.- Habitus and maculation as in Fig. 42. Body broadly oval, prominently convex. Color: varied, polymorphic species; head black, mouthparts and antennae pale yellow; pronotum and elytra from yellow to black, or pinkish-red, maculate with black spots; pattern (Figs. 42a, 42b); ventral surface from yellow to brown. Vestiture: dorsal surface glabrous, except setose head; ventral surface and legs setose. Sculpture: head finely punctate; pronotum shiny, without isodiametric meshes between punctures (Fig. 81); elytra coarsely and distinctly punctate, punctures unequal. Thorax: pronotum with front and lateral margins beaded; elytral margin narrowly beaded. Legs: tarsal formula 4-4-4, claws appendiculate with prominent basal tooth.

Variation.- Size: TL 4.0-5.5 mm; W 3.2-4.3 mm. Polymorphic species, color and maculation (Figs. 42a, 42b,) varied from light brownish-yellow to black.

Distribution.- Holarctic Region, widely ranging in North America, Fig. 133. Recorded from: Alaska, Alberta, British Columbia, northern California, Connecticut (Britton, 1915), Idaho, Illinois, Labrador, Maine, Manitoba, Massachusetts, Michigan, Minnesota, Montana, Nova Scotia, Newfoundland, New Hampshire, New Jersey, New York, North Dakota, Northwest Territories, Ontario, Oregon, Pennsylvania, Quebec, Saskatchewan, Utah, Washington, and Yukon.

Collecting and natural history notes.- Habitat: subarctic tundra, boreal forest, taiga, parkland. Arboricole on *Acer negundo*, *Betula occidentalis*, *B. papyrifera*, *Populus trichocarpa*, *Salix* spp., *Corylus* sp., *Larix laricina*, *Picea glauca*, *P. mariana*, *Abies lasiocarpa*. Occasionally found in fields on *Medicago sativa*, and other plants infested with aphids. Taken from specimen labels (22 individuals): "On hazel infested with aphids, mites, and *Lecanium* species. Creston, British Columbia." For list of localities within the study area see Appendix "A".

Number of specimens examined.- 1650.

3.20 Genus *Adalia* Mulsant

Adalia Mulsant, 1850:49. Replacement name for *Idalia* Mulsant, 1846:44. Not Huebner, 1819. Type-species: *Coccinella bipunctata* Linnaeus, 1758:364. Subsequently designated by Crotch, 1874:99.

Derivation of name.- From Greek, *adales* = harmless; in reference to feeding habits (beneficial, aphidophagous).

Comparison.- Distinguished from other North American Coccinellini by: pronotum maculate with M-shaped dark mark which delimits two white spots inside this mark (Fig. 43). The white spots at the base of pronotum distinguish *Adalia* specimens from immaculate *Cycloneda* specimens (Fig. 45); with exception of melanic morphs (Fig. 43A), which are easily recognized by predominantly black pigmentation. Polymorphism in *Cycloneda* species is not known.

Description.- Coccinellini of medium size (TL 4.0-5.0 mm). Body oval, convex. Color: head black, frons with two, yellowish-white, interocular spots; pronotum mostly black, maculation M-shape, lateral margins whitish-yellow; elytra red-orange, ~~maculate with~~ black spots, polymorphic; ventral surface and legs black. Head: eyes relatively large, finely faceted, narrowly emarginate; antennae of 11 articles each, moderately long, clavate; mandibles bifid at apex; maxillary palpus of 3 articles each, ultimate article securiform. Thorax: pronotum trapezoidal, recessed above eyes. Sculpture: dorsal surface unequally punctate, shiny. Metacoxal arcs complete, semicircular. Legs: tarsal formula 4-4-4, claws appendiculate.

Distribution.- World wide, introduced to many areas, *e.g.*, New Zealand, Australia.

Natural history.- Both larvae and adults are aphidophagous. Life histories of several North American species wereescribed by Palmer (1914).

3.20.1 *Adalia bipuctata* (Linnaeus)

Coccinella bipunctata Linaaeus, 1758:364. Type locality: "Europa." Type in BMNH, not studied.

Coccinella frigida (Schneider), 1792:172. Type locality: ?northern Europe. Type not studied. Synonymized by Leng, 1903:195.

Coccinella bioculata Say, 1824:94. Type locality: "United States." Type lost. Synonymized by Crotch, 1874:102.

Coccinella humeralis Say, 1824:95. Type locality: "Arkansa." Type lost. Synonymized by Crotch, 1874:102.

Coccinella disjuncta Randall, 1838a: 33. Type locality: "Maine." Type lost. Casey (1899:87) indicated the possibility of conspecifity with *C. frigida*. Synonymized by Leng, 1903:195.

Coccinella melanopleura LeConte, 1860:286. Type locality: "California."

Adalia ophtalmica Mulsant, 1850:56. Type locality: "l'Amerique du Nord." Type not studied. Synonymized by Leng, 1903:195.

Coccinella annectans Crotch, 1873:371. Type locality: "Colorado." Synonymized by Palmer, 1911:299.

Adalia ovipennis Casey, 1899:86. Type locality: "Sonoma Co., California." Type in USNM. Synonymized by Lusis, 1947a, 1961).

Adalia transversalis Casey, 1899:86. Type locality: "Las Vegas, New Mexico." Type in USNM. Synonymized by

Lusis, 1947a, 1961).

Adalia ornatella Casey, 1899:86. Type locality: "Colorado." Type in USNM. Synonymized by Leng, 1903:195.

Adalia coloradensis Casey, 1908:401. Type locality: "Boulder Co., Colorado." Type in USNM. Synonymized by Palmer, 1911:299.

Comparison.- Distinguished from similar Cycloneda species by combination of characters: metacoxal arcs complete (incomplete in Cycloneda); maculation of pronotum (Fig. 43, 43a, 43b); details of male genital armature.

Description.- Habitus and maculation as in Fig. 43. Body short oval, prominently convex. Color: head black with two, whitish-yellow, interocular spots; mouthparts and antennae light brown; pronotum whitish-yellow, maculation elytra orange-yellow, maculate with black spots, polymorphic. Sculpture: dorsal surface distinctly punctate, polished; punctures of elytra large, unequal. Elytra: margins narrowly reflexed, beaded. Abdomen: metacoxal arcs complete.

Larval stages described by Gage (1920:41), and Emden (1949:275).

Variation.- Size: TL 4.0-5.0 mm; W 3.0-3.9 mm. Color and pattern: polymorphic species, for further details see Lusis (1932, 1947a, 1947b, 1961).

Distribution.- Holarctic Region. Introduced to Australia and New Zealand, in North America widely distributed (Fig. 134). Recorded from: Alabama, Alaska, Alberta, Arizona, British Columbia, California, Colorado, Connecticut, Delaware, District of Columbia, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Manitoba, Maryland, Massachusetts, Michigan, Minnesota, Montana, Nebraska, Nevada, Newfoundland, New Brunswick, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Northwest Territories, Ohio, Ontario, Oregon, Pennsylvania, Quebec, Rhode Island, Saskatchewan, South Carolina, South Dakota, Tennessee, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, Wyoming, and Yukon.

Collecting and natural history notes.- Habitat: parkland and forests. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 560.

3.21 Genus Olla Casey

Olla Casey, 1899:84,93. Type-species: Coccinella abdominalis Say, 1824:95. Not Thunberg, 1794:viii. Subsequently designated by Korschefsky, 1932:288.

Derivation of name.- Origin unknown.

Comparison.- Distinguished from other North American

Coccinellini by: general habitus and polymorphic maculation (Fig. 44); male genital armature figured by Chapin, (1965; p.220): basal lobe bifurcate.

Description.- Body broadly oval, prominently convex. Head: antennae of 11 articles each, moderately long; terminal article of maxillary palpus securiform, that of labial palpus cylindrical. Abdomen with six visible sterna. Metacoxal arc incomplete. Legs: tibial spurs present; tarsal formula 4-4-4, claws with quadrate basal tooth. Male genital armature (figured by Chapin, 1965:220): basal lobe symmetrical, bifurcate apically. Female genitalia: Infundibulum absent.

Distribution.- Panamerican genus, introduced to Guam. In North America represented by a single species - _O. v-nigrum_ (Mulsant) = _O. abdominalis_ (Say).

Natural history.- Predaceous both as larvae and adults, aphidophagous. Life cycle described by Palmer, 1911.

3.21.1 _Olla v-nigrum_ (Mulsant)

Coccinella abdominalis Say, 1824:95. Not Thunberg, 1794. Type locality: "Arkansa." Type lost.

Daulis v-nigrum Mulsant, 1866:64. Type locality: ?United States. Synonymized by Timberlake, 1943:24.

Cycloneda sayi Crotch, 1871:6. Unnecessary replacement name for *C. abdominalis* Say, 1824. Preoccupied.

Olla plagiata Casey, 1899:94. Type locality: " None specified. " Type in USNM. NEW SYNONYMY.

Olla sobrina Casey, 1899:94. Type locality: "Florida." Type in USNM. NEW SYNONYMY.

Olla minuta Casey, 1908:406. Type locality: "Texas (Brownsville)." Type in USNM. NEW SYNONYMY.

Olla fenestralis Casey, 1899:95. Type locality: "Las Vegas, New Mexico." Type in USNM. NEW SYNONYMY.

Olla abdominalis arizonae Casey, 1924:158. Type locality: "Arizona (near Tuscon)." Type in USNM. NEW SYNONYMY.

Note on synonymy.- Upon examination of type specimens in Casey's collection (USNM), I consider these to be color, polymorphic variants of, and conspecific with *O. v-nigrum*. This conclusion is based on: autapomorphic structure of male genital armature among different color variants of this polymorphic species; existence of intermediates between seemingly distinct color morphs.

Comparison.- This is the only species of this genus known from the study area.

Description.- Habitus and maculation as in Fig. 44.

Body broadly oval, markedly convex. Color: polymorphic species; melanic specimens mostly black dorsally, except yellow border of pronotum laterally, and orange-red, elongate spots in anterior half of each elytron; ventral side and legs brown to black, except brown tarsi; non-melanic specimens mostly whitish-yellow dorsally, maculate with brown-black spots, pattern (Fig. 44); ventral side and legs brownish-yellow, except metaepimera, metaepisterna whitish-yellow. Vestiture: normal for genus. Sculpture: head, pronotum, and elytra finely, evenly punctate, shagreened.

Variation.- Size: TL 4.2-4.9 mm; W 3.5-4.2 mm. Color and pigmentation: polymorphic species, O. plagiata was described based on mostly black, melanic specimens.

Distribution.- Widely ranging, transcontinental in North America, Mexico and Middle America, Fig. 135. Recorded from: Alabama, Arizona, Arkansas, southern British Columbia, California, Colorado, Connecticut, District of Columbia, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Mexico, North Carolina, Ohio, Oklahoma, Oregon, South Carolina, Tennessee, Texas, Utah, Virginia, Washington, and West Virginia. Within the study area, recorded only from the southern British Columbia (Summerland).

Number of specimens examined.- 65.

3.22 Genus Cycloneda Crotch

Cycloneda Crotch, 1871:6. New name for Daulis Mulsant, 1850:295. Not Erichson, 1842. Type-species: Coccinella sanguinea Linnaeus, 1763:11. Subsequently designated by Crotch, 1874:162.

Note.- Timberlake (1943:23) suggested that the genus Cycloneda is an arbitrary assemblage of species, and the proper use of this name should be restricted to C. sanguinea and related species (characteristically with immaculate elytra). Many species presently referred to Cycloneda will have to be transferred to Neda, and other taxa.

Comparison.- Distinguished from other North American Coccinellini by combination of characters: immaculate, orange-red elytra; incomplete metacoxal arcs; maculation of pronotum (Fig. 45).

Description.- Coccinellini of medium size (3.5-7.0 mm). Body short oval, prominently convex. Color: head black, except frons with two, large, interocular yellowish-white spots; pronotum mostly black, except narrowly white lateral margins; elytra orange-red to red, immaculate; ventral surface and legs black to light brownish-yellow. Head: eyes relatively large, finely faceted, emarginate; antennae of 11 articles each, moderately long, clavate;

mandibles bifid at apex; maxillary palpus of 3 articles each, ultimate article securiform; pronotum trapezoidal, recessed above eyes. Elytra: margins narrowly reflexed. Abdomen: metacoxal arcs incomplete, subparallel with sternal margin. Legs: tarsal formula 4-4-4, claws appendiculate.

Distribution.- Western Hemisphere. Genus with more than 30 species included (Mader, 1958). Only three species are recorded from North America, _C. sanguinea_, _C. munda_, and _C. polita_.

Natural history.- Both larvae and adults are predaceous on aphids, scale insects. Life history of _C. polita_ Casey was described by Palmer (1912).

3.22.1 _Cycloneda polita_ Casey

Cycloneda polita Casey, 1899:93. Type locality: None specified. "California, Washington State, British Columbia, and Idaho."

Cycloneda polita flava Timberlake, 1943:24. Type locality: "Alameda, California." Type not studied.

Description.- Habitus and maculation as in Fig. 45. Body short oval, prominently convex. Color: head black with two, whitish-yellow, interocular spots; mouthparts and antennae light brownish-yellow; pronotum mostly black, maculate whitish-yellow; elytra orange-red, immaculate;

elytra: margins narrowly reflexed, beaded; epipleura not foveate. Legs: normal, tarsal claws appendiculate, with large basal quadrate tooth. Abdomen: metacoxal arcs incomplete, subparallel with sternal margin.

Variation.- Size: TL 4.0-4.5 mm; W 3.5 mm. Color: from orange-brown or beige to deep red (85% of specimens examined).

Distribution.- Western North America, Fig. 136. Recorded from: southern Alberta, southern British Columbia, California, Idaho, Oregon, and Washington.

Collecting and natural history notes.- Habitat: cultivated fields (alfalfa), parkland, coniferous forest. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 76.

3.23 Genus Coccinella Linnaeus

Coccinella Linnaeus, 1758:364. Type-species: Coccinella septempunctata Linnaeus, 1758:365. Subsequently designated by Crotch, 1874:105. The designation of Coccinella marginata Fabricius, 1801: by Hope (1840:29) is invalid.

Coccicnella Voet, 1806. Misspelling.

Spilota Billberg, 1820:61. Type-species: Coccinella undecimpunctata Linnaeus, 1758:366. Subsequently designated by Timberlake, 1919:163. NEW SYNONYMY.

Note on synonymy.- C. septempunctata and C. undecimpunctata are in my opinion congeneric taxa. This is based on possession of autapomorphic characters (borne by male genital armature, structure of female genitalia, as well as general body structure and color pattern, especially of pronotum and elytra) in specimens of these two species. Thus, Spilota is a junior synonym of Coccinella.

Derivation of name.- From Latin, coccineus, coccinus = scarlet-colored; named in reference to elytral color.

The North American species of this genus have been studied by Casey (1899), Leng (1903), Dobzhansky (1931), and Brown (1962, 1967). Dobzhansky (1925, 1926) redefined this genus as it is understood today.

Comparison.- Distinguished from other North American Coccinellini by combination of characters: pronotum mostly black, except yellowish-white anterior angles; orange-red color of elytra; details of male genital armature (figured by Dobzhansky, 1931); female genitalia (infundibulum present).

Description.- Medium to large Coccinellini (4.0-7.0 mm). Body broadly oval, moderately to prominently convex. Color: head black with two, yellowish-white interocular spots, or transverse yellowish-white band; antennae and mouthparts brown to black; base of mandibles in some species white; pronotum mostly black, maculate with trapezoidal or triangular, white mark at anterior angles; front margin narrowly bordered white in some species; elytra yellow to orange-red, maculate or not; if maculate, pattern basically six spots on each elytron (Fig. 48); in some species spots either absent or confluent; ventral surface black, except episterna, epimera and metasternum white. Vestiture: dorsal surface glabrous, except setose head; ventral surface and legs setose. Sculpture: head and pronotum distinctly punctate, shagreened (Fig. 79); elytra unequally punctate, shiny. Thorax: prosternum with two carinae, convergent anteriorly. Elytra: margins narrowly reflexed; epipleura not foveate. Legs: tibiae each with two prominent spurs at distal end; tarsal formula 4-4-4; claws with prominent tooth at base. Abdomen: metacoxal arcs divided into two branches, first subparallel with sternal margin, second recurved antero-laterally. Male genitalia (figured by Dobzhansky, 1931:3,5): sipho arcuate, siphonal capsule well developed in most species, rudimentary in *C. undecimpunctata* and *C. fulgida*; basal lobe in shape species specific (figured by Brown, 1962:795). Lateral lobes each shorter or equal in length with basal lobe, setigerous distally. Female genitalia: (figured by Dobzhansky, 1931:12); spermatheca sclerotized, arcuate cylinder; accessory gland large; infundibulum well developed.

Distribution.- Holarctic Region, with 11 species described for North America, 10 for the Palaearctic region. Center of diversity seems to be in northwestern North America. The following five species are common to Holarctic Region: *C. transversoguttata*, *C. monticola*, *C. trifasciata*, *C. hieroglyphica*, *C. undecimpunctata*. In North America, the number of species markedly decreases southward. From Mexico only four species are recorded: *C. novemnotata*, *C. californica*, *C. monticola*, and *C. nugatoria* (Brown, 1967). In southern latitudes this genus is replaced by species of *Cycloneda* Crotch.

Natural history.- Immature stages for most North American species were described by Palmer (1912), with some notes on larval habits. Both larvae and adults are predaceous on Aphidae. For additional references see Hodek (1966, 1972).

3.23.0 Key to species

1 (0) Interocular area pale yellow; pronotal anterior margin above eyes pale yellow 2

1' Interocular area with two pale spots; pronotal anterior margin above eyes black 3

2 (1) Body length ca. 5.0 mm; elytral suture not pigmented black ....*C. trifasciata* L. (23.9)

2' Body length ca. 7.0 mm; elytral suture narrowly pigmented black ......*C. novemnotata* Herbst (23.5)

3 (1') Elytral suture narrowly pigmented black 4

3' Elytral suture not pigmented black 6

4 (3) Pronotal anterior angles rounded; yellowish-white mark large, extended medially ....*C. prolongata* Cr. (23.10)

4' Pronotal anterior angles acute; yellowish-white mark small, not extended medially 5

5 (4') Body length ca. 5.0 mm; alpine zone of Rocky Mountains...........................*C. alta* Brown (23.1)

5' Body length ca. 7.0 mm; Pacific coast...*C. californica* Mann. (23.8)

6 (3') Each elytron maculate in addition to scutellar spot or transverse band with one/two transverse discal spots/bands, and subapical spot 7

6' Each elytron maculate in addition to scutellar spot with five separate spots Pacific coast...*C. undecimpunctata* L. (23.7)

7 (8) Each elytron maculate with two post-scutellar spots/bands 8

7' Each elytron maculate with single, relatively large, subapical spot; scutellar band uniquely tricuspate (Fig. 58). ....*C. hieroglyphica* L. (23.4)

8 (7) Each elytron maculate by prominent round scutellar spot, prominent transverse discal band extended obliquely almost from suture to lateral margin, and round/oval subapical spot 9

8' Each elytron maculate with distinct scutellar transverse band (Fig. 50), relatively short transverse discal dash, not extended over 1/2 width of elytron, and relatively small subapical spot... ....*C. transversoguttata* Fald. (23.3)

9 (8) Size (TL 5.2-7.2 mm). Each elytron prominently maculate by round discal spot, oblique transverse discal spot extended nearly from suture to lateral margin ....*C. monticola* Muls. (23.2)

9' Size (TL 4.5-5.0 mm). Each elytron maculate with round scutellar spot, small sublateral spot at 2/5 joined with transverse median spot to form relatively narrow oblique band, and relatively small subapical spot. Arctic, subarctic North America ....*C. fulgida* Watson (23.6)

3.23.1 *Coccinella alta* Brown

Coccinella suturalis Casey, 1899:89. Not Olivier, 1791. Type locality: "Colorado." NEW SYNONYMY.

Coccinella alta Brown, 1962:798. Type locality: "Alta, Salt Lake Co., Utah." Holotype in USNM. Paratypes: 2 in CNC, No. 7782.

Note on synonymy.- C. suturalis was described from a female specimen. The name is a primary junior homonym, thus not available. Brown (1962) when describing C. alta as new species indicated, but was doubtful about the above synonymy. Upon examination of type specimen, C. suturalis Casey I consider C. suturalis Casey conspecific with C. alta Brown, based on narrowly pigmented suture of elytra.

Comparison.- Some specimens of this species resemble small specimens of C. monticola from which they can be distinguished by narrowly pigmented, black elytral suture.

Description.- Habitus and maculation as in Fig. 46. Color: head black, with two well separated, interocular white spots; pronotum mostly black, except anterior angles maculate with yellowish-white spots, anterior margin pigmented black at middle; elytra reddish-orange, maculate with black spots; each elytron with oblique submedian spot and transversely oval apical spot; sutural margin narrowly pigmented black; ventral surface and legs black, except mesepimera white. Male genitalia (figured by Brown, 1962): basal lobe gradually but distinctly narrowed; longer than lateral lobes.

Variation.- Size: TL 4.8-5.3 mm; W 3.2-4.0 mm.

Distribution.- Western North America, Fig. 137. Recorded from: mountains of Alberta, British Columbia, California, Colorado, Idaho, Montana, Utah, and Wyoming.

Collecting and natural history notes.- Habitat: alpine and subalpine tundra; specimens collected from elevations 4,000 to 11,000 ft; 1,350 to 3,500 m. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 23.

3.23.2 Coccinella monticola Mulsant

Coccinella monticola Mulsant, 1850:115. Type locality: "Rocky Mountains." Type not studied.

Coccinella lacustris LeConte, 1852:131. Type locality: " Lake Superior." Synonymized by Dobzhansky, 1931:14.

Coccinella nevadica Casey, 1899:88, Type locality: "Reno, Nevada." Synonymized by Leng, 1903:201.

Coccinella alutacea Casey, 1899:89. Type locality: "New Mexico." Type in USNM. Synonymized by Dobzhansky, 1931:17.

Coccinella impressa Casey, 1899:89. Type locality: "California." Type in USNM. Synonymized by Dobzhansky,

1931:17.

Coccinella nivicola monticola: Dobzhansky, 1931:17. Misidentification.

Coccinella transversoguttata alutacea: Leng, 1903:200. Misidendification.

Coccinella monticola alutacea: Johnson, 1910:63.

Coccinella monticola sellica Johnson, 1910:63. Type locality: Not specified. "California and New Hampshire."

Coccinella monticola postica Johnson, 1910:63. Not *Coccinella postica* Mulsant, 1850. Type locality: "California." Synonymized by Brown, 1962:802.

Coccinella monticola confluenta Johnson, 1910:63. Type locality: "California." Synonymized by Brown, 1962:802.

Coccinella monticola biguttata Johnson, 1910:63. Not *C. biguttata* Fabricius, 1787. Type locality: "Buena Vista, Colorado." Synonymized by Brown, 1962:802.

Comparison.- Distinguished from other North American North American *Coccinella* species by combination of characters: large size (TL 5.2-7.2 mm); elytral maculation (similar to that of *C. alta* Fig. 46); details of male genital armature (figured by Brown, 1962:795).

Description.- Habitus and maculation similar as in *C. alta*, but specimens are much larger (Fig. 46). Color: head black, with two small, well separated, interocular spots; pronotum mostly black, except anterior angles maculate with yellowish-white, trapezoidal spots; anterior margin pigmented black at middle; elytra reddish-orange, maculate with black spots; each elytron with prominent, oblique spot near middle and transverse apical spot; elytral suture not pigmented. Male genitalia (figured by Brown, 1962:795): median lobe gradually tapered to point; apical portion less slender than in *C. alta*, lateral lobes shorter than median lobe.

Variation.- Size: TL 5.2-7.2 mm; W 4.2-5.2 mm. Variation in elytral maculation is probably clinal. Specimens from southwestern areas have the elytral spots reduced (California, Oregon), or missing entirely (Nevada).

Distribution.- Widely ranging in North America, Fig. 138. Recorded from: Alaska, Alberta, Arizona, British Columbia, California, Colorado, Idaho, Kansas, Maine, Manitoba, Michigan, Minnesota, Montana, Nevada, New Brunswick, New Hampshire, New Mexico, New York, Nova Scotia, Ontario, Oregon, Pennsylvania, Quebec, Saskatchewan, South Dakota, Utah, Washington, Wisconsin, and Wyoming.

Collecting and natural history notes.- Habitat: parkland, mixed and coniferous forests. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 68.

3.23.3 *Coccinella transversoguttata* Falderman

Coccinella transversoguttata Falderman, 1835:454. Type locality: "Siberia." Type not studied.

Coccinella quinque-notata Kirby, 1837:230. Not Haworth, 1812. Type locality: "540", Cumberland House; Saskatchewan. Synonymized by Dobzhansky, 1931:14, 15.

Coccinella ephippiata Zetterstedt, 1838:235. Type locality: "Greenland." Type not studied.

Coccinella transversalis Mulsant, 1850:117. (in part). Synonymized by Dobzhansky, 1931:14. Type not studied.

Coccinella 5-notata: Fitch, 1862:849. Unjustified emendation.

Coccinella transversoguttata richardsoni Brown, 1962:790.

Comparison.- Distinguished from other North American *Coccinella* species by combination of characters: size (TL 5.0-7.5 mm); general habitus and maculation (Fig. 50); and transcontinental distribution in temperate North America (Fig. 139).

Description.- Habitus and maculation as in Fig. 50. Color: head black, with two well separated, interocular white spots; pronotum mostly black, except anterior angles maculate with yellowish-white, trapezoidal spots, and anterior margin pigmented black at middle; elytra reddish-orange, maculate with black spots; sub-basal band composed of coalescent humeral and scutellar spots, in some specimens reduced to scutellar spot only; each elytron with median and subapical transverse spot, infrequently with small sublateral spot at 2/5; ventral surface and legs black, except mesepimera white, metepimera pale to black. Male genitalia (figured by Brown, 1962:795): apical portion of basal lobe hastate, extended well beyond apices of lateral lobes.

Variation.- Size: TL 5.0-7.5 mm; W 4.5-5.8 mm.

Distribution.- Holarctic Region. Widely ranging in North America, Fig. 139. Recorded from: Alaska, Alberta, Arizona, British Columbia, California, Colorado, Connecticut, Delaware, District of Columbia, Greenland, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Labrador, Maine, Manitoba, Maryland, Massachusetts, Michigan, Minnesota, Montana, Nebraska, Nevada, Newfoundland, New Brunswick, New Hampshire, New Jersey, New Mexico, New York, North Dakota, Northwest Territories, Ohio, Oklahoma, Ontario, New Brunswick, Oregon, Pennsylvania, Quebec, Rhode Island, Saskatchewan, South Dakota, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, Wyoming, and Yukon.

Collecting and natural history notes.- Habitat: parkland, mixed and coniferous forests. For list of localities within the study area see Appendix "A". Hosts: Homoptera- *Cinara brevispinosa* (G.&P.) on *Pinus*; *Acyrthosiphon pisum* (Harris) on *Trifolium*; *Brachyacaudus cardui* on *Cirsium*; *Chaitophorus populicola* Thomas on *Populus balsamifera*; *Aphis* species complex, on *Epilobium canadensis*; psyllid nymphs on *Alnus*.

Number of specimens examined.- 850.

3.23.4 *Coccinella hieroglyphica* Linnaeus

Coccinella hieroglyphica Linnaeus, 1758:365. Type locality: "Suecia." Type not studied.

Coccinella tricuspis Kirby, 1837:231. Not Thunberg, 1795. Type locality: None given. Type probably in BMNH. Synonymized by Dobzhansky, 1926:20.

Coccinella mannerheimi Mulsant, 1850:106. Type locality: "Siberia." Type not studied. Synonymized by Dobzhansky, 1926:21.

Coccinella kirbyi Crotch, 1874:37. Unnecessary replacement name for *C. tricuspis* Kirby, 1837:231.

Coccinella humboldtiensis Nunenmacher, 1912:448. Type locality: "Crescent City, Del Norte Co., California." Type in CAS. Synonymized by Dobzhansky, 1931:27.

Comparison.- Distinguished from other North American *Coccinella* species by combination of characters: size (TL

3.7-4.7 mm); general habitus and maculation (Fig. 58); transcontinental range in western North America (Fig. 140).

Description.- Habitus and maculation as in Fig. 58. Color: head black, with two well separated, interocular white spots; pronotum mostly black, with anterior margin pale at middle, in some specimens this pale band very narrowly interrupted by median stripe; elytra reddish-orange, maculate with black spots; tricuspate sub-basal band prominent and with large, transverse spot at apical 1/4; elytral suture not pigmented; mesepimera brown; metepimera black. Male genitalia (figured by Dobzhansky, 1931): basal lobe elongate, triangular in dorsal aspect, apex bluntly pointed; lateral lobes equal in length with basal lobe.

Variation.- Size: TL 3.7-4.7 mm; W 4.0 mm.

Distribution.- Holarctic Region. Widely ranging in temperate North America, Fig. 140. Recorded from: Alaska, Alberta, Fritsh Columbia, California, Idaho, Manitoba, Michigan, Minnesota, Montana, North Dakota, Northwest Territories, Ontario, Oregon, Quebec, Saskatchewan, South Dakota, Washington, and Yukon.

Collecting and natural history notes.- Habitat: parkland and mixed and coniferous forests. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 235.

3.23.5 *Coccinella novemnotata* Herbst

Coccinella 9-notatata Herbst, 1793:269. Type locality: "North America." Type not studied.

Coccinella franciscana Mulsant, 1853:147. Type locality: "California." Type not studied. Synonymized by Dobzhansky, 1931:8.

Coccinella degener Casey, 1899:88. Type locality: "Fort Wingate, New Mexico." Type in USNM. Synonymized by Dobzhansky, 1931:6.

Comparison.- Distinguished from other North American *Coccinella* species by characters given in the above key.

Description.- Habitus and maculation as in Fig. 47. Color: head black with broad, white interocular band; pronotum mostly black, except anterior angles and margin narrowly yellowish-white; elytra reddish-orange, maculate with black spots; each elytron with five distinct spots that decrease in size in western populations; sutural margin very narrowly pigmented black; ventral surface and legs black, except mesepimera and metepimera white to infuscate. Male genitalia: apical portion of basal lobe broadly triangular, separated from it by large notch on each side; lateral lobes shorter than basal lobe.

Variation.- Size: TL 4.0-7.0 mm; W 3.5-5.0 mm. The variation in elytral maculation is probably clinal. Typical

C. novemnotata is represented by eastern specimens, with distinctly maculate elytra. Specimens with elytral maculation reduced except for the scutellar spot were described as C. franciscana from California. C. degener and C. oregona were described based on indistictly maculate specimens from the Pacific coastal region.

Distribution.- Widely ranging in North America, Fig. 141. Recorded from: Alabama, Alberta, Arizona, Arkansas, British Columbia, California, Colorado, Connecticut, Delaware, District of Columbia, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Manitoba, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Northwest Territories, Ohio, Oklahoma, Ontario, Oregon, Pennsylvania, Quebec, Rhode Island, Saskatchewan, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

Collecting and natural history notes.- Habitat: cultivated fields (alfalfa), parkland. For list of localities within the study area see Appendix "A". Hosts: Macrosiphum pisi (Harris); Therioaphis maculata; according to McMullen, 1967.

Number of specimens examined.- 578.

3.23.6 Coccinella fulgida Watson

Coccinella nugatoria: Leng, 1919:17. Misidentification.

Coccinella undecimpunctata: Dobzhansky, 1931:28. Misidentification.

Coccinella fulgida Watson, 1954:45. Type locality: "Cape Henrietta Maria, Ontario." Holotype in CNC, No. 6146.

Comparison.- Distinguished from other North American Coccinella species by combination of characters: size (TL 4.5-5.0 mm); maculation of elytra (Fig. 53); geographic distribution range in subarctic North America (Fig. 144).

Description.- Habitus and maculation as in Fig. 53. Color: head black, with two well separated, interocular white spots; pronotum mostly black, except anterior angles yellowish-white; anterior margin pigmented black at middle, anterior angles maculate with white trapezoidal mark; elytra reddish-orange, maculate with black spots; each elytron with small to relatively large scutellar spot, small sublateral spot at 2/5 joined with transverse median spot to form oblique dash, transverse apical spot; sutural margin not pigmented black; ventral surface and legs black, except mesepimera white to black. Male genitalia (figured by Watson, 1954): basal lobe subparallel basally, constricted to form acute apex, lateral lobes equal in length with basal lobe.

Variation.- Size: TL, 4.5-5.0 mm; W 3.8-4.0 mm. Some specimens of several other species somewhat resemble specimens of *C. fulgida*. Of these, *C. undecimpunctata*, *C. hieroglyphica humboldtiensis*, and *C. monticola* have ventral white spot of each anterior pronotal angle large, trapezoidal and extended posteriorly as far as dorsal spot. In *C. difficilis* body is more convex and specimens are on everage larger. In *C. alta* the sutural margins of elytra are pigmented black. Brown (1962) pointed out that *C. fulgida* may have an unusual sex ratio. From 20 specimens studied by him, only 3 were males.

Note.- The Alaskan specimens in USNM were misidentified by Dobzhansky (1931) as *C. undecimpunctata*. Chapin (1956) misidentified this species for *C. difficilis*. Leng (1919) reported this species as *C. nugatoria* from Langston Bay and Kater Point, Bathurst Inlet; Northwest Territories.

Distribution.- Arctic and subarctic North America, Fig. 144. Recorded from: Alaska, northern British Columbia, northern Ontario, northern Quebec, Northwest Territories, and Yukon.

Collecting and natural history notes.- Habitat: arctic, subarctic tundra, tundra-boreal forest. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 23.

3.23.7 Coccinella undecimpunctata Linnaeus

Coccinella 11-punctata Linnaeus, 1758:366. Type locality: "Europe." Type not studied.

Comparison.- Distinguished from other North American Coccinella species by combination of characters: size (TL 4.0-5.0 mm); maculation (Fig. 48); range in western coastal and more widely eastern North America (Fig. 144). Palaearctic species introduced to North America.

Description.- Habitus and maculation as in Fig. 48. Color: head black, with two well separated, interocular white spots; pronotum mostly black, except anterior angles yellowish-white, anterior margin pigmented black at middle; elytra reddish-orange, maculate with black spots; each elytron with five other, small but distinct black spots, elytral suture not pigmented; ventral surface and legs black, except mesepimera white, metepimera pale to black, infuscate.

Larva described by Emden (1949:276).

Variation.- Size: TL 4.0-5.0 mm; W 3.0 mm. Color and pigmentation: elytral spots (humeral, sublateral) reduced or missing in some specimens.

Distribution.- Holarctic Region, northern Africa, Iceland but not Greenland, introduced to North America. Recorded from: eastern coast (Schaeffer, 1912); Maine, Massachusetts, New Brunswick, Newfoundland, New Jersey, New York, Nova Scotia, Ontario, Prince Edward Island, and Quebec. Western coast (1970), southern British Columbia, and Washington (Fig. 144).

Collecting and natural history notes.- Habitat: cultivated fields (alfalfa), seashore grassy communities, and parkland. I personally collected specimens of this species only in Vancouver, coastal British Columbia. Adults were collected on aphid-infested Medicago sativa plants in English Bay, almost at sea level. Especially common near seashore, on grasses and other herbaceous vegetation, including woody plants, e.g., Salix, and Betula species. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 48.

3.23.8 Coccinella californica Mannerheim

Coccinella californica Mannerheim, 1843:312. Type locality: "California." Type not studied.

Coccinella johnsoni Casey, 1908:403. Type locality: "San Diego, California." Type in USNM. NEW SYNONYMY.

Note on synonymy.- C. johnsoni was described based on a maculate specimen of C. californica. Casey (1908) in description of this species remarked that he originally considered this specimen to be "a spotted modification of

C. californica. Dobzhansky (1931) referred to C. californica indistinctly maculate specimens, which Brown (1962) treated as C. johnsoni. Brown (1962) further noted that C. californica and C. johnsoni are separable only by elytral maculation. The male genital armature of specimens referred to either species is identical. The individuals from British Columbia and Washington are intermediate between distinctly maculate specimens from California, and immaculate specimens of typical morph of C. californica. Based on the extent of variation in maculation of elytra, and the structure of male genital armature, I consider C. johnsoni conspecific with C. californica. Thus C. johnsoni is a junior synonym of C. californica.

Comparison.- Specimens of C. californica resemble some of C. novemnotata, which differ in having interocular region and anterior pronotal margin white. C. johnsoni was described based on maculate specimens.

Description.- Habitus and maculation as in Fig. 51, 54. Color: head black, two well separated, interocular spots; pronotum mostly black, except anterior angles yellowish-white; anterior margin pigmented black at middle; elytra reddish-orange, maculate with scutellar spot small humeral and median spots in some specimens indistinct; sublateral spot at 2/5; one or two subapical spots; elytral suture narrowly pigmented black; ventral surface and legs black, except mesepimera white, metepimera black. Male genitalia (figured by Brown, 1962): apical portion of basal lobe broadly triangular, separated from it by small notch on each side, lateral lobes shorter than basal lobe.

Variation.- Size: TL 5.0-6.8 mm; W 3.9-4.7 mm.

Distribution.- Pacific coast of North America, Fig. 142. Recorded from: Alaska, Alberta, Arizona (Dobzhansky, 1931), British Columbia, California, Iowa, Missouri (Wingo, 1952), Oklahoma (Brown, 1962), Oregon and Washington.

Collecting and natural history notes.- Habitat: cultivated fields (alfalfa), and parkland, generally on aphid infested plants west of Continental Divide. Individual specimens appear time to time east of Rocky Mountains, but these were most probably transported there by human agency. This is the most plausible explanation for single records of adults far away from the species' breeding range. Wingo (1952), reported single adult specimens from Iowa, Missouri, and suggested that these were carried there with shipments of fruits and vegetables. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 224.

3.23.9 Coccinella trifasciata Linnaeus

Coccinella trifasciata Linnaeus, 1758:365. Type locality: Lappland. Type in BMNH, not studied.

Coccinella perplexa Mulsant, 1850:1022. Type locality: "l'Amerique septentrionale". Synonymized by Dobzhansky, 1931:22.

Coccinella subversa LeConte, 1854:19. Type locality: Oregon. Synonymized by Dobzhansky, 1931:23.

Coccinella barda LeConte, 1860:286. Type locality: Punto de los Reyes, Marin Co; California. Synonymized by Crotch, 1873:370.

Coccinella eugenii Mulsant, 1866:95. Type locality: California. Type not studied. Synonymized by Dobzhansky, 1931:24.

Coccinella juliana Mulsant, 1866:141. Type locality: California. Type not studied. Synonymized by Dobzhansky, 1931:23.

Comparison.- Distinguished from other North American *Coccinella* species by combination of characters: yellowish-white interocular area, anterior margin of pronotum above eyes - pale yellow; size (TL 4.8-5.1 mm); maculation (Fig. 52); transcontinental range in temperate North America (Fig. 145).

Description.- Habitus and maculation as in Figs. 52, 54. Color: head black, with two separated or confluent interocular white spots; pronotum mostly black, anterior margin white at middle, except in some females; elytra reddish-orange, maculate with three, black fasciae; median and subapical fascia interrupted at suture; elytral suture not pigmented; ventral surface and legs black, except mesepimera and metepimera white. Male genitalia (figured by Dobzhansky, 1931): apical portion of basal lobe slender, equal in length with lateral lobes.

Variation.- Size: TL 4.8-5.1; W 3.8-4.0 mm. Some authors considered the Eurasian and North American populations to be specifically distinct, based on the differences in color and maculation. As Brown (1962) pointed out, these characters vary geographically, almost clinally. Dobzhansky (1931) demonstrated that variants of C. trifasciata overlap in distribution in North Amarica, and the tendency for reduced pigmentation of elytra is also known in specimens from southern Siberia and Mongolia.

Distribution.- Holarctic Region. In North America transcontinental (Fig. 145). Recorded from: Alaska, Alberta, British Columbia, California, Colorado, Connecticut, Delaware, District of Columbia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Labrador, Manitoba, Maryland, Massachusetts, Michigan, Minnesota, Montana, Nebraska, Nevada, Newfoundland, New Hampshire, New Jersey, New Mexico, New York, North Dakota, Northwest Territories, Ohio, Oklahoma, Ontario, Oregon, Pennsylvania, Quebec, Rhode Island, Saskatchewan, South Dakota, Utah, Vermont, Washington, Wisconsin, Wyoming, and Yukon.

Collecting and natural history notes.- Habitat: cultivated fields (alfalfa), parkland, boreal forest. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 540.

3.23.10 *Coccinella prolongata* Crotch

Coccinella prolongata Crotch, 1873:371. Type locality: None specified, here restricted to Utah.

Coccinella bridwelli Nunenmacher, 1913:76. Type locality: "Tahquitz Valley, San Jacinto Mountains; California." Type in CAS. Synonymized by Dobzhansky, 1931:11.

Coccinella prolongata sequoiae Dobzhansky, 1931:10. Type locality: "near Camp Wolverton, 7,000 to 9,000 ft; Sequoia National Park, California." Type in CAs, not studied.

Comparison.- Distinguished from other North American *Coccinella* species by combination of characters: general habitus and maculation (Fig. 49); size (TL 5.7-7.0 mm); distribution range in western North America (Fig. 143); details of male genital armature (figured by Brown, 1962:795).

Description.- Habitus and maculation as in Fig. 49. Color: head black, with two large, interocular white spots;

pronotum mostly black, except anterior angles with large, trapezoidal, white margings, wider than in any other Coccinella species; pigmentation of pronotum reduced to broad basal band and parallel sided median stripe; elytra reddish-orange, maculate with black spots; each elytron with small submarginal spot near mid-line, and apical spot; sutural margin very narrowly pigmented dark-brown; ventral surface and legs black, except mesepimera and metepimera white to infuscate. Male genitalia (figured by Dobzhansky, 1931): median lobe with apical portion broadly triangular in dorsal aspect, similar to that of C. californica but separated from basal portion by much larger, deeper notch, lateral lobes shorter than median lobe.

Variation.- Size: TL 5.7-7.0 mm; W 4.7 mm. Melanism was observed in some Californian specimens. C. sequoiae was described based on specimens with scutellar spot large; each elytron with very large, irregular black spot at apical 3/5. Recorded from Mono County only. C. bridwelli was described based on specimens with elytra entirely black. Recorded only from Santa Rosa Peak (8,000 ft), and Idyllwild in San Jacinto Mountains; Riverside County.

Distribution.- Western North America, Fig. 143. Recorded from: southern Alberta, southern British Columbia, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, Oregon, Washington, and Wyoming.

Collecting and natural history notes.- Habitat: In the study area, only six specimens were collected in southernmost Alberta, and British Columbia. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 6.

3.24 Genus *Hippodamia* Dejean

Hippodamia Dejean, 1836:456. Type-species: *Coccinella tredecimpunctata* Linnaeus, 1758:365. Subsequently designated by Crotch, 1874:94.

Adonia Mulsant, 1846:39. Type-species: *Coccinella mutabilis* Scriba, 1790:183. (=*C*. *variegata* Goeze, 1777:247). Designated by Mulsant (1846:39) through monotypy. NEW SYNONYMY.

Note on synonymy.- As pointed out by Brown and de Ruette (1962), the characters used to distinguish members of *Adonia* and *Hippodamia* fail in some North American species. Specimens of *Adonia* species are supposedly characterized by: pronotal base margined with a distinct bead; metacoxal arcs complete, well impressed; males with first segment of front and middle tarsi markedly dilated. However, metacoxal arcs are constantly obscured or absent in *H*. *tredecimpunctata*, *H*. *americana*, *H*. *falcigera*, *H*. *washingtoni*, and present in most but not all specimens of other North American species. Males of *H*. *sinuata*, *H*. *oregonensis*, and *H*. *caseyi* possess markedly dilated first segment of front and middle tarsi. Based on this inconsistency of characters, *H*. *variegata*, and *H*. *tredimpunctata* are in my opinion congeneric taxa, based on a autapomorphic structure of the male genital armature confined to the genus *Hippodamia*. Thus, *Adonia*, is a junior synonym of *Hippodamia*.

Hemisphaerica Hope, 1840:157. Type-species: *Coccinella quinquesignata* Kirby, 1837:230. Originally designated. NEW SYNONYMY.

Note on synonymy.- *C. tredecimpunctata* and *C. quinquesignata* are in my opinion congeneric taxa. This conclusion is based on possession of autapomorphic characters (borne by male genital armature, cleft tarsal claws, as well as general body structure and color pattern) in specimens of these two species. Thus, *Hemisphaerica* is a junior synonym of *Hippodamia*.

Ceratomegilla Crotch, 1873:365. Type-species: *Ceratomegilla ulkei* Crotch, 1873:365. Fixed by monotypy. The designation of *Coccinella maculata* Degeer, 1775:392; by Korschefsky (1932:312) is invalid. NEW SYNONYMY.

Spiladelpha Semenov & Dobzhansky, 1923:99. Type-species: *Spiladelpha barovskii* Semenov & Dobzhansky, 1923:99. Subsequently designated by Mader, 1926:87. Synonymized by Brown & Ruette, 1962:646.

Note on synonymy.- The genus *Ceratomegilla* was described by Crotch (1873) from a single male specimen. The diagnostic characters given to separate members of this genus from *Hippodamia* were as follows: pronotum sinuate and beaded at base; antennae unique, third article "broadly dilated at apex, with the inner angle ciliate." Scott (1933) noted that the modified (dilated) third antennal article is a male character. As pointed out by Brown and de Ruette (1962), for 60 years the genus was known from the holotype only. This resulted in that Ceratomegilla has been confused with other genera, and the genus remained inadequately defined. Based on the autamorphic structure of the male genital armature, confined to the genus Hippodamia, as well as general body structure, it is evident that Ceratomegilla Crotch as represented by its type-species C. ulkei, is a member of the genus Hippodamia. Thus Ceratomegilla Crotch is a junior synonym of Hippodamia. The genus Spiladelpha was erected to include three species from high altitudes in the mountains of southwestern Siberia, Russian Turkestan, and Tibet. Each species was reported from the type locality only (Brown and de Ruette, 1962).

Derivation of name.- Hippodamia from Greek, mythical name. First used by Dejean (1836), who credited its origin to Chevrolat.

The North American species of this genus have been studied by: Brown and de Ruette (1962); Casey (1899, 1908); Chapin (1946); Crotch (1873); Leng (1903); Timberlake (1919); and Wingo (1952).

Comparison.- Distinguished from other North American Coccinellini by combination of: color of elytra from yellow-orange to orange-red; middle and hind tibiae with two prominent spurs each; tarsal claws apendiculate, notched; details in structure of male genital armature (as indicated below, and see plate "A", p. 22).

Description.- Coccinellini of small to medium size (3.0-7.5 mm). Body form: elongate oval, oblong. Color: head black, except frons with interocular yellowish-white band or spots; mouthparts and antennae light brownish-yellow, in some species brown; pronotum mostly black, except lateral and anterior margins yellowish-white (in H. moesta only anterior angles yellowish-white). In some species, black discal area with V-shaped, yellowish-white vittae; elytra from yellow to orange-red, maculate with black spots or longitudinal bands; in some species, pigmentation reduced or coalescent; ventral surface and legs black, except with mesepimera and metepimera white, tibiae and tarsi light brownish-yellow in some species. Vestiture: dorsal surface glabrous, except head, antennae and mouthparts setose. ventral surface and legs setose. Sculpture: head distinctly punctate, shagreened; in some species, punctures large, unequal; pronotum and elytra distinctly punctate, shagreened; in some species punctures large, unequal and coalescent. Head: antennae of 11 articles each, relatively long, clavate; mandibles bifid at apex; maxillary palpus of 3 articles each, ultimate article triangular; labial palpus of 3 articles each, slender and cylindrical. Thorax: pronotum convex, recessed above eyes; lateral margins shalowly reflexed. Elytra: apex in some species acute; lateral margin narrowly but distinctly reflexed. Legs:

middle and hind tibiae with two prominent spurs distally; tarsal formula 4-4-4, each claw prominently cleft, bifid. Abdomen: metacoxal arcs complete, distinctly impressed, obscure or absent in some species. Male genitalia (see Plate "A", p. 22): median lobe (sipho) arcuate tube, without siphonal capsule; basal lobe variously modified at apex, modification species specific (figured for North American species by Chapin, 1946). Female genitalia (figured by Chapin, 1946): spermatheca sclerotized, arcuate cylinder; accessory gland large; infundibulum present.

Distribution: Holarctic Region. Predominantly North American genus with more than 25 species described for the world (Chapin, 1946; Kapur, 1968). One species, _H. convergens_, also recorded from Mexico, Central America, and northern South America.

Natural history.- Both larvae and adults are predaceous on aphids and mites. Vaundell and Storch (1972) listed hosts by names. The life cycle of more common species was described by Palmer (1912).

3.24.0 Key to species

1(0) Tibiae and tarsi of all legs yellowish-brown, femora black. Each elytron maculate with seven separate black spots ....*H. tredecimpunctata* (L.) 24.14

1' Legs brownish-black to black, or only with tarsi brownish-yellow 2

2 (1') Pronotum mostly black, with distinct yellowish-white, V-shaped mark in middle; lateral and anterior margins narrowly bordered yellowish white 3

2' Pronotum mostly black, without distinct yellowish-white, V-shaped marks; laterally, anterior margins narrowly bordered yellowish-white 4

3 (2) Pronotum mostly black, with indistinct yellowish-white, V-shaped mark in middle (in some specimens reduced to small spots); black discal mark extended laterally and in some species anteriorly to margin, as in Figs. 60, 64, to divide yellowish-white border into segments 11

3' Pronotum mostly black, without yellowish-white, V-shaped mark in middle; anterior and lateral margins unevenly bordered yellowish-white about as in frontispiece 7

4 (2') Head black, with two interocular, whitish-yellow spots; pronotum mostly black, only lateral margins narrowly bordered yellowish-white; elytra mostly black, except base and lateral margins orange-yellow (Fig. 57). Arctic, subarctic North America, and alpine zone in the Rocky Mountains ....*H. ulkei* (Crotch) (24.16)

4' Pronotum with discal black mark irregular in outline about as in Figs. 62, 66 5

5 (4') Elytra maculate with black subapical lunate spot, not extended to apex 6

5' Elytra maculate with black subapical spot extended to apex, or if maculation reduced, apex narrowly pigmented black (Fig. 62).. H. apicalis Casey (24.5)

6 (5) Distribution: transcontinental in most of North America. Male genitalia: basal lobe terminated in arrow-like apex. Maculation: similar to Fig. 66. ....H. parenthesis (Say) (24.10)

6' Distribution: Pacific coastal North America. Male genitalia: basal lobe suddenly constricted in apical 1/5, and produced into finger-like projection terminated in bulbous point....................................H. lunatomaculata Motsch. (24.11)

7 (3') Each elytron maculate with longitudinal vitta, extended from humeral angle almost to apex, sinuate in posterior half; suture narrowly pigmented black (Fig. 59). Boreal North America...H. falcigera Crotch (24.6)

7' Each elytron maculate in addition to postmedian lunule and subapical spot with transverse humeral band. Maculation in some specimens confluent longitudinally. Alpine, subalpine zone of the Rocky Mountains ....H. oregonensis Crotch (24.9)

9 Elytral suture narrowly pigmented black, at anterior 1/3 pigmentation extended laterally into inverted T-shaped crossbar (Fig. 56). Boreal North America..H. americana Crotch (24.2)

9' Elytral suture not pigmented black, except at anterior 1/3 maculate with inverted T-shaped spot (Fig. 69). Pacific coastal North America....................................H. washingtoni Timb. (24.15)

10 Elytra with suture narrowly pigmented black, with transverse cross-bar as in previous species, maculation confluent, elytra mostly black (Fig. 55). Arctic, subarctic North America ....H. arctica (Schneider) (24.1)

11 (3) Elytra maculate with transverse humeral band, or in melanic specimens mostly black 12

11' Elytra maculate with separate humeral spot, and inverted T-shaped scutellar spot (Fig. 60). Western North America ....H. caseyi Johnson (24.3)

12 (11) Elytral maculation: submedian and apical spots relatively large, oval. Size: TL 4.7-6.0 mm...................................H. moesta LeConte (24.8)

12' Elytral maculation (Fig. 67): submedian spot fused to sublateral spot, or separate; subapical spot indistinct or absent. Size: TL 5.0-5.6 mm. Widely ranging. ....H. quinquesignata (Kirby) (24.12)

13 Elytral maculation (Fig. 68): suture pigmented in anterior 1/4 by elongate scutellar spot....................................H. sinuata Mulsant (24.13)

13' Elytral maculation (Fig. 61): suture not pigmented black, except for small, oval scutellar spot; in maculate specimens, each elytron with up to six additional, separate spots ....H. convergens Guérin-Méneville (24.4)

14 Elytral maculation (Fig. 63): suture not pigmented black, without scutellar spot, except scutellum black. Size: TL 5.9-7.0 mm..H. glacialis (Fab.) (24.7)

3.24.1 *Hippodamia arctica* (Schneider)

Coccinella arctica Schneider, 1792:148. Type locality: "? Lapland."" Type not studied.

Adonia arctica (Schneider): of authors. See note on synonymy under generic description.

Comparison.- Distinguished from other North American *Hippodamia* species by: small size (TL 3.0-3.8 mm); range in arctic, subarctic North America (Fig. 147); unique elytral maculation (Fig. 55), elytral suture bordered black. This species is a member of the *parenthesis* group of Chapin (1946).

Note.- Scott (1933) reported this species from Kirkman Creek, Yukon Territory; and Eagle, Alaska on the Yukon boundary as *Adonia amoena* Falderman - a Siberian species. As noted by Brown and de Ruette (1962), these records are based on specimens of *H. arctica*. Furthermore, Mader (1926) expressed doubts that *H. amoena* and *H. arctica* are specifically distinct. Without specimens of *H. amoena* avaiable for study, the status of this species can not be decided at present time.

Description.- Habitus and maculation as in Fig. 55. Body elongate oval, oblong. Color: head black with two interocular, yellowish-white spots; antennae and mouthparts light brownish-yellow; pronotum mostly black, lateral and anterior margins bordered whitish-yellow; elytra mostly black, maculate with yellow vittae, pattern (Fig. 55); ventral surface and legs black, except tarsi brown. Sculpture: dorsal surface distinctly punctate, shagreened, dull in appearance; punctures unequal, shallow. Elytra: margins narrowly reflexed. Abdomen: metacoxal arcs complete, distinctly impressed. Male genitalia (figured by Brown and de Ruette, 1962): basal lobe stout, markedly constricted apically to form spade-like process.

Variation.- Size: TL 3.0-3.8 mm; W 2.0-2.3 mm.

Distribution.- Arctic and subarctic North America, Fig. 147. Recorded from: Alaska, northern British Columbia, Labrador, northern and central Quebec, Northwest Territories, and Yukon.

Collecting and natural history notes.- Habitat: arctic and subarctic tundra, on plants infested with aphids. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 10.

3.24.2 Hippodamia americana Crotch

Hippodamia americana Crotch, 1873:368. Type locality: "Hudson Bay." Type not studied.

Comparison.- Distinguished from other North American Hippodamia species by combination of characters: size (TL 4.0-4.5 mm); distinctive elytral maculation (Fig. 56);

range in boreal North America (Fig. 148); unique male genital armature (figured by Chapin, 1946).

Description.- Habitus and maculation as in Fig. 56. Body elongate oval, oblong. Color: head black with yellowish-white, interocular spot; mouthparts and antennae light brownish-yellow; pronotum mostly black, except anterior and lateral margins narrowly bordered whitish-yellow; elytra yellow-orange, maculation black, suture narrowly pigmented black; ventral surface and legs black; tarsi light brownish-yellow. Sculpture: dorsal surface distinctly punctate, shagreened.

Variation.- Size: TL 4.0-4.5 mm; W 2.3-2.5 mm.

Distribution.- Widely ranging in northern half of North America, Fig. 148. Recorded from: Alberta, British Columbia, Manitoba, Northwest Territories, Ontario, and Saskatchewan.

Collecting and natural history notes.- Habitat: boreal forest and parkland, on plants infested with aphids. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 31.

3.24.3 Hippodamia caseyi Johnson

Hippodamia convergens caseyi Johnson, 1910:21, 33. Type locality: "Fairfield, Washington." Type not studied.

Comparison.- Distinguished from other North American Hippodamia species by: larger size (5.5 mm); details of male genital armature (figured by Chapin, 1946); and unique elytral maculation (Fig. 60).

Description.- Habitus and maculation as in Fig. 60. Body elongate oval, oblong. Color: head black with yellowish-white interocular band; mouthparts and antennae yellowish-brown; pronotum mostly black with anterior and both anterior and posterior angles yellowish-white, black discal area with two convergent yellowish-white vittae; mesepimera and metepimera white; elytra orange-yellow with black maculation; each elytron with humeral, large post-scutellar, small marginal, transverse discal and subapical spot; ventral surface and legs black except tarsi brown-black. Sculpture: head and pronotum finely punctate, shagreened; elytra more coarsely punctate, shagreened. Abdomen: metacoxal arcs complete, distinctly impressed.

Variation.- Size: TL 5.5 mm; W 2.9-3.2 mm.

Distribution.- Western North America, Fig. 149. Recorded from: Alberta, British Columbia, Colorado, Idaho, Montana, Oregon, Utah, and Washington.

Collecting and natural history notes.- Habitat: Cultivated fields (alfalfa), parkland. Fields and McMullen (1972) reported overwintering aggregations in central British Columbia, e.g. from Apex Mt. (2,248 m), Baldy Mt.

(2,303 m), Beaconsfield Mt. (2,196 m), Mt. Kobau (1,975 m), and Sheep Rock (2,200 m). Aggregation sites were on south facing upper-most slopes of the mountains, among fractured boulders covered with lichens. The movement upwards to aggregation sites from lower valleys was gradual, from early September to mid-October when these sites were covered by snow. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 142.

3.24.4 Hippodamia convergens Guérin-Méneville

Hippodamia convergens Guerin-Meneville, 1844:321. Type locality: "Mexico and California." Type not studied.

Hippodamia praticola Dejean, 1836:456. Nomen nudum.

Hippodamia modesta Melsheimer, 1847:178. Type locality: "Pennsylvania." Type not studied. Synonymized by Chapin, 1946:23.

Hippodamia convergens var. obsoleta Crotch, 1873:367. Type locality: None specified. Synonymized by Chapin, 1946:23.

Hippodamia juncta Casey, 1899:80. Type locality: "Sonoma County, California." Type in USNM. Synonymized by Chapin, 1946:22.

Comparison.- Distinguished from other North American

Hippodamia species by combination of characters: V-shaped, yellowish-white mark on black disc of pronotum; and from species which also possess this character, by size (TL 5.5-7.0 mm), and elytral maculation.

Description.- Habitus and maculation as in Fig. 61. Body elongate oval, oblong. Color: head black, frons with interocular, yellowish-white mark; mouthparts and antennae light brownish-yellow; pronotum mostly black, except anterior and lateral margins yellowish-white, disc with two, posteriorly convergent, yellowish-white vittae; scutellum black; elytra orange-yellow, in most specimens maculate, each elytron with 7 brown-black spots (Fig. 61); ventral surface and legs brown-black.

Variation.- Size: TL 5.5-7.0 mm; W 4.0-5.0 mm. Variation in elytral maculation was studied by Kellogg and Bell (1904), and Yosida (1956). Results of both studies indicate that approximately 86% of specimens possess full complement of six black spots on each elytron, 14% had some spots missing, 3.75% had more than 12 modal spots, and only 0.2% (Yosida, 1956) with some spots coalescent. It is noteworthy, that eight specimens collected in Mexico (Hidalgo), have all elytral spots mising.

Distribution.- Nearctic Region, and Middle America, introduced to Cuba. Widely ranging in North America, Fig. 152. Recorded from: Alabama, Alberta, Arizona, Arkansas, British Columbia, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Manitoba, Maryland, Massachusetts, Mexico, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Ontario, New Brunswick, Oregon, Pennsylvania, Quebec, Rhode Island, Saskatchewan, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming. This is the commonest and most widespread species of Hippodamia in North America. Hawkes (1926) reported aggregations of this species from Yosemite Valley, California.

Collecting and natural history notes.- Habitat: cultivated fields (alfalfa), chaparral, grassland and parkland. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 890.

3.24.5 Hippodamia apicalis Casey

Hippodamia apicalis Casey, 1899:81. Type locality: Reno, Nevada. Type in USNM.

Hippodamia parenthesis expurgata Casey, 1908:400. Type locality: Boulder Co., Colorado. Type in USNM. NEW SYNONYMY.

Hippodamia lengi Johnson, 1910:55. Type locality: San Diego, California. Type location unknown. Synonymized by Chapin, 1946:9.

Hippodamia lunatomaculata expurgata: Timberlake, 1919:166. Misidentification.

Hippodamia lunatomarginata expurgata: Korschefsky, 1932:342. Misidentification.

Hippodamia expurgata: Chapin, 1946:72. NEW SYNONYMY.

Adalia nigromaculata Nunenmacher, 1934:20. Type locality: "San Diego County, California." Type in CAS. Synonymized by Chapin, 1946:9.

Hippodamia apicalis tricolor Nunenmacher, 1946:72. Type locality: "Lassen county, California." Type in CAS, not studied. Synonymized by Hatch, 1962.

Note on synonymy.- Upon examination of type specimens in Casey's collection (USNM), and large series of specimens from northwestern United States (Idaho, Utah), I consider H. expurgata: Chapin, 1946:72; (= H. parenthesis expurgata Casey) to be conspecific with H. apicalis Casey, based on continous variation of apical portion of basal lobe of male genital armature.

Comparison.- Distinguished from other North American Hippodamia species by combination of characters: size (TL

3.5-4.5 mm); unique elytral maculation (subapical lunule extended to apex); distribution in western North America (Fig. 150).

Description.- Habitus and maculation as in Fig. 62. Body elongate oval, oblong. Color: head black, except crown-like, yellowish-white interocular mark; mouthparts and antennae light brownish-yellow; pronotum mostly black, except anterior and lateral margins whitish-yellow; elytra yellow to yellow-orange, maculate with black spots, pattern (Fig. 62); ventral surface and legs black, except rufo-light brown front tibiae and tarsi; mesepimera and metepimera white. Vestiture: frons sparsely, mouthparts and antennae setose; dorsal surface of pronotum and elytra glabrous, elytral apex with several setae; ventral surface and legs setose. Sculpture: head and pronotum distinctly punctate, shagreened; elytra distinctly punctate, punctures large, unequal. Elytra: apex acuminate.. Abdomen: sternum III with metacoxal arcs complete, distinctly impressed. Male genitalia (figured by Chapin, 1946): apical portion of basal lobe varied from slender to broad triangle.

Variation.- TL 3.5-4.5 mm; W 2.0-3.0 mm. Maculation of elytra varied; spots reduced (southern Alberta). Subapical lunule confluent with humeral spot (some British Columbia and Washington specimens). H. lengi was described based on specimens with subapical lunule enlarged, extended to suture and confluent with scutellar spot (California).

Distribution.- Western North America, Fig. 150. Recorded from: Alaska, Alberta, Arizona, British Columbia, California, Colorado, Idaho, Montana, Nebraska, Nevada, New Mexico, Oregon, Saskatchewan, South Dakota, Utah, Washington, Wyoming, and Yukon.

Collecting and natural history notes.- Habitat: sagebrush, Pinon-Juniper chaparral, xeric savannas and parkland. Collected on *Artemisia tridentata* infested with mites of *Bryobia* species. For list of localities, see appendix "A".

Number of specimens examined.- 145.

3.24.6 *Hippodamia falcigera* Crotch

Hippodamia falcigera Crotch, 1873:368. Type locality: "Slave Lake, Hudson's Bay". Type not studied.

Hippodamia sinuata albertana Casey, 1924:157. Type locality: "Edmonton, Alberta." Type in USNM. Synonymized by Chapin, 1946:7.

Ceratomegilla cottlei Nunenmacher, 1934:20. Type locality: "Yellowstone Park, Wyoming." Type in CAS. Synonymized by Chapin, 1946:7.

Comparison.- Distinguished from other North American *Hippodamia* species by combination of characters: size (TL 5.1-5.3 mm); unique elytral maculation (each elytron with longitudinal vitta, curved posteriorly; and distribution in northwestern North America (Fig. 153).

Description.- Habitus and maculation as in Fig. 59. Body elongate oval, oblong. Color: head black; frons with median, interocular, yellowish-white spot; mouthparts and antennae light brownish- yellow; pronotum mostly black, anterior and lateral margins bordered yellow; elytra yellow, each maculate with longitudinal vitta, curved at posterior end; suture pigmented black, tapered posteriorly. ventral surface and legs black; mesepimera and metepimera yellowish-white. Abdomen: metacoxal arcs obscured. Male genitalia (figured by Chapin, 1946): basal lobe broadly rounded apically, narrowly constricted at apex.

Variation.- Size: TL 5.1-5.3 mm; W 3.0-3.2 mm. Specimens of this species do not appear to vary markedly in maculation or size. Chapin (1946:7) noted lack of pigmentation of pronotum in one specimen, and vittae of elytra divided into two parts in another.

Distribution.- Northwestern North America, Fig. 153. Recorded from: Alberta, British Columbia, Idaho, Northwest Territories, Wyoming, and Yukon.

Collecting and natural history notes.- Habitat: boreal forest and parkland, on plants infested with aphids. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 48.

3.24.7 Hippodamia glacialis (Fabricius)

Coccinella glacialis Fabricius, 1775:80. Type locality: "America boreali." Type not studied.

Hippodamia extensa Musant, 1850:17. Type locality: "Californie septentrionale." Type not studied. Synonymized by Chapin, 1946:16.

Hippodamia lecontei Mulsant, 1850:1010. Type locality: "Santa Fe de Bogota," = Santa Fe; New Mexico. Type not studied. Synonymized by Chapin, 1946:17.

Hippodamia hoppingi Nunenmacher, 1934:21. Type locality: "Mt. Stillman, Tulare County, California." Type in CAS. Synonymized by Chapin, 1946:17.

Hippodamia glacialis mackenziei Chapin, 1946:19. Type locality: "Inyo County, California." Type in USNM, No. 57892.

Comparison.- Distingished from other North American Hippodamia species by combination of: general habitus and maculation (Fig. 63); size (TL 5.9-7.0 mm); and transcontinental range in temperate North America (Fig. 155).

Description.- Habitus and maculation as in Fig. 63. Color: head black with white interocular spot; pronotum mostly black, narrowly bordered white, with two oblique white marks; elytra orange-red, maculate with black spots; subapical spot large, conspicuous; two postmedian spots large and obliquely coalescent; anterior spots missing.

Variation.- Size: TL 5.9-7.0 mm; W 3.7-4.7 mm. Larger and broader than most *Hippodamia* species. Specimens from eastern half of North America are characterized by frequent absence of spots 1/2, 1, and 2; in some specimens absence of spot 3, and confluence of spots 4 and 5. Pronotum in most specimens marked with yellowish-white oblique vittae. *H. extensa* was described based on specimens with spots 2, 4, 5, and 6 absent, and frequent confluence of spots 1/2, 1, and 3 to form basal transverse bar. Pronotal oblique mark obliterated (coastal California). *H. glacialis mackeziei* was described from melanic specimens from high elevations in mountains of eastern California. Spots 1/2, 1, 3, 4, 5, and 6 confluent to form butterfly-shaped spot covering about two-thirds of elytra. Spot 2 separate and distinct.

Distribution.- Widely ranging in North America, Fig. 155. Recorded from: Alabama, Alberta, Arizona, British Columbia, California, Colorado, Dakotas, Idaho, Illinois, Indiana, Manitoba, Michigan, Montana, New Mexico, Northwest Territories, Ontario, Oregon, Quebec, Saskatchewan, South Carolina, Utah, Washington, and Wyoming.

Collecting and natural history notes.- Habitat: cultivated fields (alfalfa), parkland. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 66.

3.24.8 Hippodamia moesta LeConte

Hippodamia moesta LeConte, 1854:19. Type locality: "Prairie Paso, Oregon." Type not studied.

Hippodamia politissima Casey, 1899:80. Type locality: "Monterey Co., California." Type in USNM. Synonymized by Chapin, 1946:21.

Hippodamia bowditchi Johnson, 1910:45. Type locality: "St. Maries, Idaho." Synonymized by Chapin, 1946:21.

Comparison.- Distinguished from other North American Hippodamia species by combination of characters: size (TL 4.1-6.0 mm); general habitus and maculation (Fig. 64); range in temperate North America (Fig. 151). Similar to H. quinquesignata, from which it differs by yellow-orange color of elytra, generally larger spots.

Description.- Habitus and maculation as in Fig. 64. Body elongate oval, oblong. Color: head black, frons with median, interocular yellow spot; mouthparts and antennae light brown; labrum, ultimate article of maxillary palpus, dark brown; pronotum mostly black, anterior angles whitish-yellow; elytra yellow to yellowish orange, maculation black; ventral surface and legs black; except mesepimera and metepimera yellowish-white. Abdomen: metacoxal arcs obscured.

Variation.- Size: TL 4.7-7.0 mm; W 2.8-4.0 mm. High degree of melanism observed in some specimens, maculation coalescent. H. moesta was described based on specimen with elytra completely black, except small whitish spot at basal margin of each elytron. H. politissima was described from immaculate specimens from California. Typical, maculate specimens were described as H. bowditchi, with the elytral pattern similar to that of H. quinquesignata.

Distribution.- Widely ranging in North America, Fig. 151. Recorded from: Alberta, British Columbia, California, Colorado, Idaho, Manitoba, Montana, Oregon, Saskatchewan, Washington, and Wyoming.

Collecting and natural history notes.- Habitat: grassland and parkland, on plants infested with aphids. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 58.

3.24.9 Hippodamia oregonensis Crotch

Hippodamia oregonensis Crotch, 1873:367. Type locality: "Oregon." Type not studied.

Hippodamia dispar Casey, 1899:79. Type locality: "Colorado." Type in USNM. Synonymized by Chapin, 1946:24.

Hippodamia puncticollis Casey, 1899:78. Type locality: "Canadian Rocky Mountains." Type in USNM. Synonymized by Chapin, 1946:24.

Hippodamia liliputana Casey, 1908:397. Type locality: "Colorado." Type in USNM. Synonymized by Chapin, 1946:25.

Hippodamia cockerelli Johnson, 1910:49. Type locality: "Sangre de Cristo Range, Saguache Co., Colorado." Type not studied. Synonymized by Chapin, 1946:25.

Comparison.- Distinguished from other North American Hippodamia species by combination of characters: small size (TL 3.5-5.0 mm); unique elytral maculation (frontispiece); range in alpine, subalpine zone of Rocky Mountains (Fig. 154).

Description.- Habitus and maculation as in Fig. 65, frontispiece. Color: head black with yellow median diamond-shaped spot; pronotum mostly black, anterior angles, lateral and anterior margin narrowly yellow; elytra red-orange, each elytron maculate with transverse humeral band, median lunate spot, and oval apical spot; ventral surface and legs black, except mesepimera and metepimera white.

Variation.- Size: TL 3.5-5.0 mm; W 2.5-3.0 mm. Maculation: Size and shape of elytral spots varied. H. lilliputana was described based on specimens with reduced elytral spots, while H. cockerelli was described from a specimen with confluent elytral maculation (Colorado). Johnson (1910) reported two other specimens from Wyoming.

Distribution.- High elevations in the Rocky Mountains, Fig. 154. Recorded from: Alberta, British Columbia, Colorado, Idaho, Montana, Oregon, Utah, Washington, and Wyoming.

Collecting and natural history notes.- Habitat: alpine forbs and meadows crawling on rocks and low vegetaion. Immediately south of study area, in Montana , I collected a number of pupae attached to rocks at elevation 6,660 ft (2,028 m) at Logan Pass, from which beetles emerged 22.VIII. Fields and McMullen (1972) reported overwintering aggregation sites in central British Columbia, e.g., from Apex Mt. (2,248 m), Mt. Baldy (2,303 m) and Beaconsfield Mt. (2,196 m). Aggregation sites were on the upper most slopes of these mountains, beneath rock slabs partially buried and with grasses and sedges growing around. Situation of these sites was such that exposure to wind resulted in shallow snow pack. In western Washington, Edwards (1957) described aggregations near the summits of Pinnacle Peak (June) and Yakima Peak (September). Chapman (1954) reported aggregations of this species near the summits of several mountains in western Montana. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 79.

3.24.10 *Hippodamia parenthesis* (Say)

Coccinella parenthesis Say, 1824:93. Type locality: "United States". Type lost.

Coccinella tridens Kirby, 1837:229. Type locality: None specified. Type lost. Synonymized by Crotch, 1873.

Adonia parenthesis: Mulsant, 1850:40.

Comparison.- Distinguished from similar *H. lunatomaculata* by: structure of male genitalia (figured by Chapin, 1946) and from *H. apicalis* by elytral maculation (subapical lunule not extended to apex).

Description.- Habitus and maculation as in Fig. 66. Body elongate oval, oblong. Color: head black, frons with three, yellowish-white, interocular spots; in some specimens confluent; mouthparts and antennae light brownish-yellow; pronotum mostly black, except anterior and lateral margins yellowish-white; elytra orange-yellow, maculate with black; each elytron with humeral spot, discal spot, and subapical lunule; front sutural spot elongate; ventral surface and legs black, except mesepimera and metepimera yellowhish-white. Elytra: apices distinctly pointed (acciculate); margins narrowly reflexed.

Variation.- Size: TL 4.5-5.1 mm; W 3.0-3.1 mm.

Distribution.- Widely ranging in North America, Fig. 156. Recorded from: Alaska, Alberta, Arizona, British

Columbia, California, Colorado, Connecticut, Delaware, District of Columbia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Manitoba, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, Nova Scotia, New Brunswick, New Hampshire, New Jersey, New Mexico, New York, North Dakota, Northwest Territories, Ohio, Oklahoma, Ontario, New Brunswick, Oregon, Pennsylvania, Quebec, Rhode Island, Saskatchewan, South Dakota, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, Wyoming, and Yukon.

Collecting and natural history notes.- Habitat: grassland and parkland, on plants infested with aphids. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 450.

3.24.11 Hippodamia lunatomaculata Motchulsky

Hippodamia lunatomaculata Motschulsky, 1845:382. Type locality: "vicinity of San Francisco Bay, California." Type not studied.

Hippodamia septemlunata: Dejean, 1836:456. Nomen nudum.

Hippodamia parenthesis: Casey, 1899:81. Misidentification.

Hippodamia lunatomarginata: Korschefsky, 1932:342.

Unjustified emendation.

Hippodamia _lunatomaculata_ _dobzhanskyi_ Chapin, 1946:11. Type locality: "Port Angeles, Washington." Type in USNM, No. 57891.

Comparison.- Distinguished from very similar _H._ _parenthesis_ by: details of male genital armature (figured by Chapin, 1946), and range in coastal western North America. See the above key for further details.

Description.- Superficially indistinduishable from _H._ _parenthesis_. Male genital armature (figured by Chapin, 1946:plate 3, Fig. 16): median lobe 1/4 longer than lateral lobes; apical 1/3 suddenly constricted and produced into slender projection, terminated in bulbous apex.

Variation.- Size: TL 4.4-5.2 mm; W 3.0 mm. Color and maculation: _H._ _lunatomaculata_ _dobzhanskyi_ was described from specimens with reduced pigmentation of pronotum, and marked enlargement of maculation on elytra (coastal Oregon and Washington, southernmost coastal British Columbia).

Distribution.- Pacific coast of North America. Recorded from: British Columbia, California, Oregon, and Washington.

Collecting and natural history notes.- Habitat: coastal chapparal, parkland, and cultivated fields. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 14.

3.24.12 *Hippodamia quinquesignata* (Kirby)

Coccinella quinquesignata Kirby, 1837:230. Type locality: "Lat. 65°." Type not studied.

Hemisphaerica quinquesignata: Hope, 1840:157.

Hippodamia mulsanti LeConte, 1852:131. Type locality: "Pic River, Lake Superior." Type in MCZ. Synonymized by Chapin, 1946:13.

Hippodamia ambigua LeConte, 1852:131. Type locality: "California and Oregon." Type in MCZ. Synonymized by Chapin, 1946:13.

Hippodamia punculata LeConte, 1852:131. Type locality: "San Francisco, California." Type in MCZ. Synonymized by Chapin, 1946:13.

Hippodamia leporina Mulsant, 1856:135. Type locality: Synonymized by Crotch, 1873:366.

Hippodamia obliqua Casey, 1899:79. Type locality: "Sonoma County, California." Type in USNM. Synonymized by Chapin, 1946:13.

Hippodamia subsimilis Casey, 1899:79. Type locality: "?California." Type in USNM. Synonymized by Chapin, 1946:13.

Hippodamia vernix Casey, 1899:79. Type locality: "Wyoming." Type in USNM. Synonymized by Chapin, 1946:13.

Hippodamia uteana Casey, 1908:397. Type locality: "Sevier Lake, Utah." Type in USNM. Synonymized by Chapin, 1946:13.

Comparison.- Distinguished from other North American *Hippodamia* species by: general habitus and maculation (Fig. 67); size (TL 5.0-5.6 mm); details of male genital armature (figured by Chapin, 1946).

Description.- Habitus and maculation as in Fig. 67. Body elongate ovoid, oblong. Color: head black, frons with large, yellowish-white interocular mark; mouthparts and antennae light brownish-yellow; pronotum mostly black, anterior and lateral margins yellowish-white; elytra orange-red, maculate with black, each elytron with humeral and discal transverse band, subapical spot; ventral surface and legs black; mesepimera and metepimera white.

Variation.- Size: TL 5.0-5.6 mm; W 3.2-3.4 mm. Elytral maculation varied. Pigmentation in specimens from the Okanagan Valley reduced, individual specimens almost immaculate, except for small scutellar spot.

Distribution.- Widely ranging in North America, Fig. 157. Recorded from: Alaska, Alberta, Arizona, British Columbia, California, Colorado, Dakotas, Idaho, Manitoba, Michigan, Montana, New Mexico, Northwest Territories, Oregon, central Quebec, Saskatchewan, Utah, Washington, Wyoming, and Yukon.

Collecting and natural history notes.- Habitat: cultivated fields (alfalfa), parkland. A. M. Harper observed overwintering aggregations of this species at several localities in southern Alberta. Beetles were found under Arctostaphylos uva-ursi (L.), ca. 3,000-5,000 individuals; under Juniperus ?sp., ca. 2,000 individuals. At Porcupine Hills, 20 miles west of Claresholm, a smaller aggregation under rock of about 100 individuals contained also several specimens of H. caseyi. (Personal communication.) For list of localities within the study area see Appendix "A".

Number of specimens examined.- 286.

3.24.13 Hippodamia sinuata Mulsant

Hippodamia sinuata Mulsant, 1850:1011. Type locality: "California." Type not studied.

Hippodamia spuria LeConte, 1861:358. Type locality: "Oregon." Type in MCZ, not studied. Synonymized by Chapin, 1946:27.

Hippodamia trivittata Casey, 1899:81. Type locality: "Sonoma County, California." Type in USNM. Synonymized by Chapin, 1946:27.

Hippodamia crotchi Casey, 1899:80. Type locality: "Lake County, California." Type in USNM. Synonymized by Chapin, 1946:27.

Hippodamia complex Casey, 1899:80. Type locality: "Vancouver Island." Type in USNM. Synonymized by Chapin, 1946:27.

Description.- Habitus and maculation as in Fig. 68. Body elongate oval, oblong. Color: head black, frons with yellowish-white, interocular mark; antennae and mouthparts light brownish-yellow; pronotum mostly black, except anterior and lateral margins yellowish-white; elytra orange-yellow, maculate with black spots; ventral surface and legs black; Abdomen: metacoxal arcs obscured.

Variation.- Size: TL 4.9-5.1 mm; W 2.7-3.2 mm.

Distribution.- Widely ranging in North America, Fig. 158 (only western distribution shown). Recorded from: Alberta, Arizona, British Columbia, California, Colorado, Idaho, Kansas, Manitoba, Montana, Oregon, Saskatchewan, Washington, Wyoming, and Yukon.

Collecting and natural history notes.- Habitat: cultivated fields (alfala), grassland and parkland, on plants infested with aphids. On Vancouver Island, D. H. Kavanaugh collected a large number of specimens by shaking out moss mats in late October. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 124.

3.24.14 Hippodamia tredecimpunctata (Linnaeus)

Coccinella 13-punctata Linnaeus, 1758:366. Type locality: "Europa." Type in BMNH, not studied.

Coccinella tibialis Say, 1824:94. Type locality: "Missouri." Type lost. Synonymized by Mulsant, 1850:10.

Comparison.- Distinguished from other North American Hippodamia species by: bicolored legs, tibiae light brownish-yellow, femora black.

Description.- Habitus and maculation as in Fig. 70. Body elongate oval, oblong. Color: head black, frons with yellowish-white interocular mark; mouthparts and antennae light brownish-yellow; pronotum mostly black, except anterior and lateral margins yellowish-white; elytra red-orange, maculate with black spots; each elytron with seven black spots; ventral surface and legs black; tibiae light brownish-yellow; mesepimera and metepimera yellowish-white.

Variation.- Size: TL 5.2-6.2 mm; W 3.1-3.5 mm.

Distribution.- Holarctic Region. Widely ranging in North America, Fig. 161. Recorded from: Alabama, Alaska, Alberta, Arizona, British Columbia, California, Colorado, Connecticut, Delaware, District of Columbia, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Labrador, Maine, Manitoba, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, Nova Scotia, Newfoundland, New Brunswick, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Northwest Territories, Ohio, Ontario, New Brunswick, Oregon, Pennsylvania, Quebec, Rhode Island, Saskatchewan, South Carolina, South Dakota, Tennessee, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, Wyoming, and Yukon.

Collecting and natural history notes.- Habitat: cultivated fields (alfalfa), grassland and parkland. For list of localities within the study area see Appendix "A". Bionomics of this species was described by Cutright (1924).

Number of specimens examined.- 467.

3.24.15 Hippodamia washingtoni Timberlake

Hippodamia washingtoni Timberlake, 1939:265. Type locality: "Longmire Spring, Mount Rainier; Washington." Type in CAS, not studied.

Comparison.- Distinguished from other North American Hippodamia species by: general habitus and maculation (Fig. 69); size (TL 5.5-6.0 mm); range in western, coastal North America (Fig. 159).

Description.- Habitus and maculation as in Fig. 69.

Body elongate oval, oblong. Color: head black with single, yellowish-white interocular spot; mouthparts and antennae yellowish brown; postantennal process pale yellow; pronotum mostly black, anterior and lateral margins bordered yellowish-white; elytra orange-yellow, maculate with black spots, each elytron with 6 spots, arranged as in Fig. 55; ventral surface and legs black, mesepimera and metepimera black. Male genitalia (figured by Chapin, 1946): similar to that of H. falcigera, sipho with comparatively large dorsal flange near apex. In specimens of H. falcigera this projection is smaller than in H. tredecimpunctata.

Variation.- Size: TL 5.2-6.0 mm; W 2.9- 3.8 mm. Pigmentation of pronotum varied only slightly, holotype with mark similar to H. tredecimpunctata, disc with blunt lateral spur on each side. Elytral maculation varied considerably. This is the only species of the tredecimpunctata group of Chapin (1946) with individual specimens without black maculation. In maculate individuals, it appears to be characteristic for spots 1/2 and 3 to be coalescent with their conterparts to form an inverted T-shaped mark.

Distribution.- Pacific coast of North America, Fig. 159. Recorded from: coastal British Columbia, Oregon and Washington.

Collecting and natural history notes.- Habitat: parkland and forest. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 3.

3.24.16 Hippodamia ulkei (Crotch)

Ceratomegilla ulkei Crotch, 1873:365. Type locality: "Hudson's Bay." Type not studied.

Hippodamia parva Watson, 1954:45. Type locality: "Cape Henrietta Maria, Ontario." Holotype in CNC, No. 6147 / slide No. 3131. NEW SYNONYMY.

Ceratomegilla parva: Brown and de Ruette, 1962:647.

Note on synonymy.- Upon examination of type specimen I consider H. parva conspecific with C. ulkei, based on the identical structure of the male genital armature. Brown and de Ruette (1962) when transferring H. parva to Ceratomegilla indicated the possibility of conspecifity with C. ulkei but did not decide.

Description.- Habitus and maculation as in Fig. 57. Body elongate oval, oblong. Color: head black with two interocular, whitish-yellow spots; mouthparts and antennae light brown; pronotum mostly black, except lateral margins narrowly yellowish-white; elytra mostly black, except base and margins orange-yellow; suture black, narrowly bordered orange-yellow at apical 2/5; ventral surface and legs black. Tarsi brownish. Vestiture: dorsal surface distinctly punctate, shagreened, dull. Punctures unequal, coalescent. Pronotum: margins narrowly beaded. Elytra: lateral margins narrowly reflexed. Legs: tarsal claws appendiculate, notched at base. Male genitalia (figured by Watson, 1959): sipho arcuate; lateral lobes each shorter than basal lobe. Female genitalia (figured by Watson, 1959): spermatheca arcuate cylinder; accessory gland relatively large.

Variation.- Size: TL 3.8-4.7 mm; W 2.8-3.0 mm. Males distinguished by dilated 3rd antennal article (triangular) and dilated basal articles of front and middle tarsi. H. parva was described based on a non-melanic specimen, with spots on elytra reduced and elytral color therefore predominantly orange-yellow (eastern subarctic region).

Distribution.- Arctic and subarctic North America, Fig. 146. Recorded from: Alaska, northern British Columbia, northern Ontario, Northwest Territories, and Yukon. Also recorded from Alberta, Mountain Park refugium (based on one elytron found under rocks).

Collecting and natural history notes.- Habitat: arctic, subarctic tundra, and alpine tundra in the northern Rocky Mountains. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 41.

3.25 Genus Macronaemia Casey

Macronaemia Casey, 1899:76. Type-species: Coccinella episcopalis Kirby, 1837:228, 309. Fixed by monotypy.

Micronaemia: Weise, 1905:218. Misspelling.

Derivation of name.- Origin unknown.

Comparison.- Distinguished from Anisosticta Chevrolat by more elongate body, maculation of elytra and details of male genital armature.

Description.- Coccinellini of small size (TL 3.0-4.0 mm). Body prominently elongate, oblong. Color: head black, except frons anteriorly yellow, pronotum and elytra yellow, maculation black; ventral surface generally black, except legs light-brownish yellow. Head: eyes emarginate, coarsely faceted; antennae moderately long, of 11 articles each, clavate; maxillary palpus securiform; mandibles bifid at apex. Thorax: pronotum convex, transverse rectangle; recessed above eyes. Elytra: margins narrowly reflexed, beaded. Legs: tarsal formula 4-4-4, claws appendiculate.

Distribution.- North America, genus with single species only.

3.25.1 Macronaemia episcopalis (Kirby)

Coccinella episcopalis Kirby, 1837:228, 309. Type locality: "Canada". Type in BMNH, not studied.

Comparison.- Distinguished from Anisosticta bitriangularis and A. borealis by more elongate body, elytral maculation (Fig. 74) and details of male genital armature.

Description.- Habitus and maculation as in Fig. 74. Body prominently elongate, oblong. Color: head black; frons yellow-white; mouthparts and antennae brownish-yellow; pronotum and elytra mostly yellow; maculation black (Fig. 74), each elytron with longitudinal, discal vitta; suture narrowly pigmented black; ventral surface brown-black, except legs light brownish- yellow; prosternum, meso- and metepimera white.

Variation.- Size: TL 3.5-4.3 mm; W 1.8 mm.

Distribution.- Widely ranging in North America, Fig. 160. Recorded from: Alaska, Alberta, British Columbia, California, Colorado, Idaho, Iowa, Kansas, Manitoba, Minnesota, Montana, Northwest Territories, Ontario, Oregon, Saskatchewan, Washington, Wisconsin, Wyoming, and Yukon.

Collecting and natural history notes.- Habitat: parkland, boreal forest, and cultivated fields. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 128.

3.26 Genus Mulsantina Weise

Mulsantina Weise, 1906:34. Replacement name for *Cleis* Mulsant, 1850: 162,208. Not Mulsant, 1850:132, 135. Type-species: *Cleis mirifica* Mulsant, 1850:209. (=*Cleis lynx* Mulsant, 1850:210). Subsequently designated by Crotch, 1874:142.

Pseudocleis Casey, 1908:406. Type-species: *Coccinella picta* Randall, 1831:51. Originally designated. Synonymized by Timberlake, 1943:19.

Note on nomenclature and synonymy.- *Cleis* Mulsant, 1850:162, 208 is a junior homonym of both *Cleis* Mulsant, 1850:132, 135; and *Cleis* Guerin, 1831 (Lepidoptera). *C. mirifica*, and *C. picta* are in my opinion congeneric taxa. Thus *Pseudocleis* is a junior synonym of *Mulsantina*. Timberlake (1943:19) reported that the male genitalia of *M. lynx* are identical with those of *M. mirifica*, thus supporting Croth (1874:142), who was first to suggest that the two were not specifically distinct. Crotch (1874) chose, for reasons best known to him, to use specific epithet *lynx* in preference to *mirifica* for this species, though the latter has a page priority.

Comparison.- Distinguished from other North American Coccinellini by general habitus (Figs. 72, 73); white prosternum, mese-and metepimera, meso- and metabasisternum, metepipleura.

Description.- Coccinellini of medium size (3.5-5.0

mm). Body oval, oblong. Head: eyes emarginate, finely faceted; antennae of 11 articles each, moderately long, clavate; mandibles bifid at apex; maxilllary palpus securiform. Thorax: pronotum recessed above eyes, narrowly explanate laterally; elytra with lateral margins narrowly reflexed; legs normal, tarsal formula 4-4-4, claws appendiculate. Abdomen: with six visible sterna; metacoxal arcs incomplete.

Distribution.- North and Middle America, West Indies. Blackweldet (1945) listed five species included in this genus.

3.26.0 Key to species

1 (0) Elytral suture narrowly pigmented brown-black...... ....*M. hudsonica* Casey (26.2)

1' Elytral suture not pigmented brown-black, if brown-black, then as part of discal mark extended to suture ....*M. picta* (Randall) (26.1)

3.26.1 *Mulsantina picta* (Randall)

Coccinella picta Randall, 1838b:51. Type locality: "Massachusetts." Type not studied.

Coccinella concinnata Melsheimer, 1847:177. Type locality: "Pennsylvania." Type lost. Synonymized by LeConte, 1850:238.

Harmonia contexta Mulsant, 1850:87. Type locality: "Mexique." Type not studied. Synonymized by LeConte, 1854:87.

Cleis minor Casey, 1899:95. Type locality: "Alameda and Siskiyou Co., California." Type in USNM. Synonymized by Leng, 1903:205.

Comparison.- Distinguished from other North American Mulsantina species by: general habitus and maculation (Fig. 73); widely ranging in North America (Fig. 162); details of male genital armature.

Description.- Habitus and maculation as in Fig. 73. Body oval, oblong. Color: Ventral surface mostly ivory-yellow, except for brown-black maculation; head black with three interocular yellow spots, in some individuals confluent; antennae and mouthparts yellow-brown; pronotum with M-shaped black, disjointed mark; prosternum, mesepimera and metepimera ivory-yellow; legs yellow-brown; elytra mostly ivory-yellow, brown-black mark on each elytron consists of longitudinal vitta extended in U-shape manner to suture, and small marginal spot at 3/5. Vestiture: normal for genus. Sculpture: head and thorax distinctly but finely punctate, shagreened; elytra prominently punctate, punctures unequal. Legs: tarsal claws with prominent basal, quadrate tooth.

Variation.- Size: TL 3.3-5.0 mm; W 3.0-3.5 mm. Color:

pigmentation of pronotum and elytra varied, from indistinctly maculate to melanic, predominantly black variants, with many intermediates. Johnson (1910:72) reported melanic variation to be continous. C. concinnata was described based on a specimen with predominantly black elytra. C. contexta was described based on a specimen with elytral basal band continued from longidutinal discal vitta to suture. C. minor was described based on a specimen with posterior lateral spot at 3/5 confluent with longitudinal vitta, and extended to margin.

Distribution.- Widely ranging in North America, Fig. 162. Recorded from: Alabama, Alberta, British Columbia, California, Colorado, Idaho, Illinois, Indiana, Kansas, Montana, New York, Ontario, Oregon, Pennsylvania, Saskatchewan, Utah, Washington, and Wyoming.

Collecting and natural history notes.- Habitat: For list of localities within the study area see Appendix "A".

Number of specimens examined.- 164.

3.26.2 Mulsantina hudsonica (Casey)

Cleis hudsonica Casey, 1899:96. Type locality: "Hudson Bay." Type in USNM.

Comparison.- Distinguished from other North American Mulsantina species by unique elytra pattern (Fig. 72).

Description.- Habitus and maculation as in Fig. 72. Body oval, oblong. Color: head yellow, vertex black; antennae and mouthparts light brownish-yellow; pronotum mostly yellow with black maculation, pattern see (Fig. 72). elytra yellow, maculate with black spots and vittae; each elytron with longitudinal discal vitta and black spot on each side; suture narrowly pigmented black; ventral surface and legs light brown to black, except prosternum, basisternum, and epimera white. Sculpture: dorsal surface distinctly punctate, elytra without isodiametric meshes between punctures, shiny. Abdomen: metacoxal arcs incomplete.

Variation.- Size: TL 4.0-4.5 mm; W 3.0 mm. Color: extent of pigmentation of head, pronotum, and elytra varied; elytral spots fused to form longitudinal vitta in some specimens.

Distribution.- Widely ranging in northern half of North America, Fig. 163. Recorded from: Alaska, Alberta, northern British Columbia, northern Manitoba, Northwest Territories, northern Ontario, northern Qubec, norther Saskatchewan, and Yukon.

Collecting and natural history notes.- Habitat: parkland and forest. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 64.

3.27 Genus Anisosticta Dejean

Anisosticta Dejean, 1836:456. Type-species: Coccinella 19-punctata Linnaeus, 1758:366. (= C. 19-punctata Fabricius, 1775.). Subsequently designated by Crotch, 1874:93.

Derivation of name.- From Greek, aniso+sticta = unequal+spots, in reference to maculation. First used by Dejean (1836), who credited its origin to Chevrolat. The name is often mistakenly attributed to Duponchel (1841, In d'Orbigny) who was the first to publish it with description of the genus.

The North American species of this genus have been studied by Brown and de Ruette (1962), Casey (1899), Leng (1903). Bielawski (1958) revised this genus for the world (Palaearctic region). Sasaji (1971) redescribed the single Japanese species.

Comparison.- Distinguished from other North American Coccinellini by combination of characters: middle and hind tibiae with single spur each; tarsal claws simple; general habitus and maculation (Fig. 75).

Description.- Coccinellini of medium size (3.0-4.0 mm). Body elongate oval, oblong. Color: dorsal surface mostly yellow, maculation of pronotum and elytra brown-black; ventral surface brown-black except, legs light brownish-yellow, prosternum white. Vestiture: dorsal surface glabrous except, frons setose; ventral surface and legs setose. Sculpture: head punctate, shagreened; pronotum punctate, shagreened; elytra coarsely punctate, without isodiametric meshes, surface shiny. Head: subquadrate, eyes finely faceted, emarginate; antennae moderately long, of 11 articles each, clavate; maxillary palpus securiform. Elytra: lateral margins narrowly reflexed. Legs: tarsal formula 4-4-4, claws simple; middle and hind tibiae with single spur each. Abdomen: metacoxal arcs complete, semicircular, well impressed.

Distribution.- Holarctic Region with five species described. Two species recorded from North America.

Natural history.- Both larvae and adults are predaceous on aphids.

3.27.0 Key to species

1 (0) Elytral suture pigmented black, maculation confluent; arctic, subarctic North America..A. borealis Timberlake (27.2)

1' Elytral suture black only at anterior 1/5th; widely ranging in North America ....A. bitriangularis (Say) (27.1)

3.27.1 Anisosticta bitriangularis (Say)

Coccinella bitriangularis Say, 1824:296. Type locality: " Northwest Territory." Type lost.

Coccinella multiguttata Randall, 1838b:51. Type locality: "Cambridge, Massachusetts." Type lost. Synonymized by LeConte, 1883:197.

Anisosticta strigata: Crotch, 1873:369. Misidentification.

Description.- Habitus and maculation as in Fig. 75. Body elongate oval, oblong. Color: head whitish-yellow, vertex black; mouthparts and antennae yellowish-brown; pronotum and elytra whitish-yellow, maculate with black spots; ventral surface black, except legs brownish-yellow, lateral margins of sterna yellowish-white. Vestiture: normal for genus. Sculpture: head punctate, shagreened; pronotum punctate, distinctly shagreened. Elytra: lateral margins distinctly reflexed. Legs: normal for genus.

Variation.- Size: TL 3.3-4.0 mm; W 2.0-2.2 mm.

Distribution.- Widely ranging in North America, Fig. 164. Recorded from: Alaska, Alberta, Britsh Columbia, California, Idaho, Manitoba, Michigan, Minnesota, Montana, North Dakota, Northwest Territories, Ontario, Oregon, Quebec, Saskatchewan, South Dakota, Washington, and Yukon.

Collecting and natural history notes.- Habitat: collected throughout the study area in marshes and other wet habitats. Treading was most successful technique in these situations. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 210.

3.27.2 Anisosticta borealis Timberlake

Anisosticta borealis Timberlake, 1943:45. Type locality: "Nulato, Alaska." Type in USNM.

Description.- Habitus and maculation as in Fig. 76. Body elongate oval, oblong. Color: head black, frons yellow anteriorly; mouthparts and antennae light brownish-yellow; pronotum and elytra yellow; maculate with black spots, pattern (Fig. 76); each elytron with spots confluent longitudinally; ventral surface black, except legs light brownish-yellow; prosternum, metepimera whitish-yellow. Legs: tarsal claws simple, enlarged at base.

Variation.- Size: TL 3.0-3.5 mm; W 2.1-2.2 mm.

Distribution.- Arctic and subarctic North America, Fig. 165. Recorded from: Alaska, northern Manitoba, Northwest Territories, northern Quebec, and Yukon.

Collecting and natural history notes.- Habitat: collected in northern regions, from pitfall traps or by hand on vegetation. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 87.

3.28 Genus *Psyllobora* Dejean

Psyllobora Dejean, 1836:458. Type-species: *Coccinella lineola* Fabricius, 1792:283. Subsequently designated by Timberlake, 1943:41.

Phyllobora Chevrolat, 1844:43. Misspelling.

Note on type species.- The designation of *Coccinella 20-maculata* Say, 1824:96; by Crotch (1874:135) is invalid. This species was not among the originally included species.

Derivation of name.- From Greek, *psyllo*+*bora* = psyllid+eater, in reference to feeding habit. First used by Dejean (1836), who credited its origin to Chevrolat.

Comparison.- Distinguished from other North American Coccinellidae by combination of characters: small size (largest 3.0 mm), color mostly yellowish-white, maculate with black spots (Figs. 77, 78).

Description.- Body broadly oval, moderately convex, glabrous. Color: from ivory-yellow to whitish-yellow and yellow, maculate with brown-black spots. Head: antennae of 11 articles each; terminal article of maxillary palpus securiform, that of labial palpus globose; mandibles with row of 3 to 9 teeth along cutting edge, and at apex. Abdomen: with six visible sterna; metacoxal arcs incomplete. Legs: normal, moderately long; tibiae simple, slender, tibial spurs absent; tarsal formula 4-4-4, claws with quadrate basal tooth. Male genital armature (figured by Hatch, 1962): basal lobe symmetrical, longer than lateral lobes, apex produced into recurved blunt point; sipho with well developed basal capsule. Female genitalia (figured by Chapin, 1965): spermatheca arcuate cylinder; infundibulum present in most species, sperm duct relatively short.

Distribution.- Western Hemisphere, genus with more than 50 species included. Widely ranging in North America, with six species recorded.

Natural history.- Davidson (1921) reported _Psyllobora taedata_ LeConte to feed on fungi of mildew type, _e.g._, _Sphaerotheca pannosa_, _Podosphaera clandestina_.

3.28.0 Key to species

1 (0) Elytra distinctly punctate; punctures unequal, coalescent. Male genitalia: basal lobe only shightly longer than lateral lobes, gradually tapered to blunt point, and slightly recurved apically; sipho relatively stout for basal 1/5, very slender for remainder of its length ....P. _vigintimaculata_ (Say) (28.1)

1' Elytra indistinctly punctate; punctures fine, well separated. Surface polished. Body markedly convex. Male genitalia: basal lobe distinctly longer than lateral lobes, markedly constricted and recurved apically; sipho relatively uniform in diameter, narrowed only at apex ....*P. borealis* Casey (28.2)

3.28.1 *Psyllobora vigintimaculata* (Say)

Coccinella 20-maculata Say, 1824:96. Type locality: "Missouri." Type lost.

Psyllobora 20-maculata taedata LeConte, 1857:70. Type locality: "California." Type not studied.

Comparison.- Distinguished from other *Psyllobora* species known from western Canada and Alaska by combination of characters: transcontinental range; unique pronotal and elytral maculation (Fig. 77); and characters outlined in the above key.

Description.- Habitus and maculation as in Fig. 77. Body ovoid, prominently convex. Color: head pale yellow, vertex with two black spots; mouthparts and antennae pale yellow; pronotum and elytra pale yellow; maculate with brown-black spots, pattern (Fig. 77); ventral surface light brown, except legs pale yellow, and metabasisternum brown-black, metepimera whitish-yellow. Sculpture: dorsal surface distinctly punctate; punctures large, unequal, coalescent. Abdomen: metacoxal arcs incomplete.

Variation.- Size: TL 1.9-2.7 mm; W 1.6-2.0 mm. Elytral maculation pattern varied, in some specimens, spots coalescent (Fig. 77).

Distribution.- Widely ranging in North America, Fig. 166. Recorded from: Alabama, Alberta, Arizona, British Columbia, California, Colorado, Connecticut, Delaware, District of Columbia, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Manitoba, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Brunswick, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Northwest Territories, Ohio, Ontario, Oregon, Pennsylvania, Quebec, Rhode Island, Saskatchewan, South Carolina, South Dakota, Tennessee, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

Collecting and natural history notes.- Habitat: orchards, parkland, and forest. For list of localities within the study area see Appendix "A". Both larvae and adults feed on mildews (Weed, 1889; Davidson, 1921).

Number of specimens examined.- 380.

3.28.2 Psyllobora borealis Casey

Psyllobora borealis Casey, 1899:102. Type locality: "Coeur d'Alene, Idaho." Type in USNM.

Comparison.- Distinguished from other Psyllobora species from western Canada and Alaska by: unique pronotal and elytral maculation (Fig. 78); larger size than P.

vigintimaculata, and restricted range to the west of the Continental Divide (Fig. 167).

Description.- Habitus and maculation as in Fig. 78. Body minute, broadly ovoid in outline; prominently convex. Color: head pale yellow, frons with two black spots; mouthparts and antennae pale yellow; pronotum and elytra ivory-yellow; maculate with brown-black spots, pattern (Fig. 78); ventral surface brown, except legs pale-yellow, mesepimera, metepimera yellowish-white. Vestiture: normal for genus. Sculpture: dorsal surface distinctly punctate, elytral punctures small, well separated. Legs: normal for genus. Abdomen: metacoxal arcs incomplete.

Variation.- Size: TL 2.7-3.0 mm; W 2.0 mm.

Distribution.- Western North America, Fig. 167. Recorded from: British Columbia, Idaho, Colorado, Montana, Oregon, Utah, and Washington.

Collecting notes.- Habitat: parkland, (orchards), forests. For list of localities within the study area see Appendix "A".

Number of specimens examined.- 123.

4.0 ZOOGEOGRAPHY

4.1 Introduction

The composition of the coccinellid fauna of western Canada and Alaska, and the peculiarities in geographic distribution of its taxa are the end result of the evolutionary history of this group. In the following, I attempt: (1) to elucidate the post-glacial origin of this fauna, particularly in reference to the Pleistocene glaciation; (2) to evaluate the significance of the Rocky Mountains as a dispersal barrier, and (3) to evaluate the effectiveness of refugia as centres of post-glacial dispersal. Furthermore, I speculate about the origin and affinities of this fauna in general. I hope that the hypotheses put forward, and the conclusions reached provide some answers to questions about the origin and history not only of the coccinellid portion of the fauna of western North America, but also other animal groups.

4.2 Distribution patterns of Coccinellidae in western North America

There have been many attempts to formally describe biotic provinces or regions for North America (Dice, 1943, 1952; Hagmeier, 1966; Van Dyke, 1919, 1926). The life zone concept, originally proposed by Merriam (1892, 1894, 1898) on the basis of temperature, has been declared unsatisfactory by Kendeigh, (1932); Shelford, (1932), and others. However, it is possible and useful to describe life zones, e.g., forest regions of Canada (Rowe, 1972), in reference to dominant tree species, or alpine zone in reference to altitude; but these concepts are fundamentally different from biotic provinces as areas with more or less uniform composition of biota. Recent studies (Kaiser et al., 1972) indicate that the basic premise of such attempts, that there are definable biotic provinces, is fallacious. The basic difference between biotic province as opposed to life zone is that the first is based on composition of the faunal/floral assemblage in a given area, whereas the life zone concept is basically ecological, i.e., different places have different habitat conditions (climatic, edaphic). As pointed out by Muesebeck and Krombein (1952), "sufficient data have been analyzed so that the range of many species may be given succinctly by reference to life zones." The map (Fig. 169), Life zones of North America, summarizes the present delineation of life zones. Here I recognize seven major zones: (AA) Arctic-Alpine; (H) Hudsonian; (C) Canadian; (T) Transition; (UA) Upper Austral; (LA) Lower Austral; (ST) Subtropical. The alpine zone in the Rocky Mountains could not be indicated on the map, because of the generally small size of these areas and the scale of this map. The subtropical zone is not considered in further discussion because the post-glacial origin of the fauna of British Columbia and Alberta was not effected by its extent, nor species composition.

The present distribution ranges of many species correlate to a high degree with the mentioned life zones, delineated by the general physiography of the continent (mountainous barriers), climatic patterns combined with types of vegetation in a given zone.

4.3 Coccinellid fauna of western Canada and Alaska.

Most of the area was glaciated during Wisconsin time (Fig. 168). The general agreement is that in glaciated areas the fauna was exterminated and/or displaced elsewhere, most species south of the limits of glacial ice. Thus it follows, that the present coccinellid fauna of western Canada and Alaska is derived post-glacially from unglaciated source areas south or north of the ice-sheet, and from refugial areas (nunataks) in the Rocky Mountains. Therefore, the questions of interest center upon the environmental zonation (life zones), and changes since the Pleistocene glaciation, the geographic location of source areas, and the recolonization of glaciated areas during Wisconsin time. The problems of interpretation are complicated by physiographically complex land surface of western Canada. Survival of biota in refugia during the Pleistocene glaciation is generally accepted. Lindroth (1969) discussed the biological significance of such refugia, their types, and provided a historical account of the ideas which led to the development of concepts of biotic refugia during glacial periods. Furthermore, Lindroth (1965) demonstrated unexpectedly favourable conditions for survival of cold adapted biota in the immediate vicinity of glacial ice in coastal areas of Iceland. In North America, the most important and the largest unglaciated area north of the continental ice-sheet, covered most of Alaska and parts of the Yukon Territory (Fig. 168, area 1), the Beringian refugium. Several authors (Matthews, 1968; 1974; 1975; Hopkins et al, 1971) documented a rich insect fauna in Beringia during Wisconsin time.

Packer and Vitt (1974) reviewed the botanical evidence suggesting numerous refugia throughout the Northern Rocky Mountains, and pointed to the area of Mountain Park in Alberta, as one of the refugia. My investigation of this area tentatively supports their evidence, based on a find of one recent elytron of Hippodamia ulkei, an arctic-subarctic coccinellid. Another example of a disjunct relict is a carabid beetle Amara alpina Paykull. This latter species is presently restricted to the subarctic, arctic regions of North America, except for disjunct populations in refugia in the alpine zone of the Rocky Mountains. I believe that at least, the highly vagile portion of the fauna of glaciated areas was not exterminated (did not became extinct), but rather was displaced (or moved) as the habitat became locally unavailable. Taxa adjust their distribution ranges according to the environmental conditions, often on a grand scale (Coope, 1970; 1972; 1973; and Coope & Angus 1975). This hypothesis is supported by disharmonious associations (faunal and floral assemblages with no extant counterparts), as reported in several palaeo-ecological studies (Hibbard et al, 1965; Matthews, 1975). The effectiveness of refugia as centres of post-glacial dispersal of biota in the Rocky Mountains is becoming increasingly evident with every systematic study conducted in western Canada (Freitag, 1965; Larson, 1975; Nimmo, 1971). In British Columbia, the glaciation was thought to have been general, and the ice-sheet to have covered the mainland and coastal islands (Vancouver Island, Queen Charlotte Islands). Calder and Taylor (1968) concluded from botanical evidence that the Queen Charlotte Islands served as a refugium during the Pleistocene glaciation. The effectiveness of coastal refugia for the coccinellid portion of the fauna is not established. Elsewhere in the Pacific Northwest, the presence of refugia was suggested by Heusser (1960), with a major refugium south of the ice-sheet (Fig. 168, source area 3).

4.3.1 Life zones

The Arctic zone (Fig. 169AA) is characterized by treeless tundra. The coccinellid fauna of the arctic zone is markedly different from that of the forested zones to the south (Hudsonian and Canadian). The number of species recorded from this zone is relatively small (27), and the affinities with the Palaearctic Region are suggested by a high proportion of circumpolar species. A number of species are endemic to this zone, e.g. Hippodamia ulkei, (Fig. 146); H. arctica (Fig. 147). The similarities with the fauna of the alpine zone in the Rocky Mountains is only analogous in the environmental conditions. The fauna of the alpine zone of the Cordillera includes some species that are primarily restricted to the arctic zone, but this element represent relicts from glacial times when arctic-subarctic zone was more extensive. This suggests that the Rocky Mountains served as a corridor for cold adapted species to extend their ranges during glacial periods.

The Alpine zone (not indicated on Fig. 169) is inhabited by a number of alpine endemics, e.g., Hyperaspis jasperensis, Hippodamia oregonensis, Coccinella alta, none of which are found in the arctic zone. The wide range of some of these species in the alpine zone of Sierra Nevada and Rocky Mountains, and their absence from the arctic zone, suggest that dispersal is relatively easy (to account for presence of C. alta, (Fig. 137) in the alpine zone of Sierra Nevada Mountains), and that other factors other than climatic control the distribution of alpine endemics. During the summer months the fauna of alpine zone is enriched by influx of species from surrounding lowlands. The summer immigrants, some of which hibernate in high elevations, cannot be classified as alpine endemics since these species do not breed at high elevations.

The Hudsonian zone (Fig. 196H) is generally characterized by open, discontinuous coniferous forests with the ground covered by lichens. Hudson Bay effectively divides both the arctic and Hudsonian zone into two separate, discontinuous sectors (see Fig. 169). The eastern populations of Hippodamia ulkei from Cape Henriettta Maria are represented by non-melanic specimens, while the western specimens are invariably melanic. The Hudsonian zone in the Rocky Mountains contains a number of relict species, very probably of Beringian derivation e.g., Hippodamia americana, H. falcigera. The rest of the fauna consists of species derived from the Canadian zone.

The Transition zone (Fig. 169T) is extensively developed east of the Rocky Mountains, but also present on the western side of the Rocky Mountains. The dominant vegetation of the eastern sector (east of the Rocky Mountains), is the deciduous forest, gradually replaced by parkland and prairie-grasslands. West of the Rocky Mountains the zone is characterized by dominance of Pinus ponderosa. The effects of the Rocky Mountains on the composition of the fauna of this zone is very pronounced. The grassland-prairie portion is inhabited by a number of endemic species, e.g., Hyperaspidius hercules, Chilocorus hexacyclus. Similarly the western sector of the Transition zone (west of the Rocky Mountains) is inhabited by endemic species, e.g., Hippodamia lunatomaculata, H. washingtoni, Coccinella californica, Psyllobora borealis, and the introduced species Coccinella undecimpunctata, or Stethorus punctillum. The Rocky Mountains are either an effective dispersal barrier for species restricted to either sector of the Transition zone, or if assumed that the dispersal is easy (as postulated in the following), the endemic faunal element of the Transition zone west of the Rocky Mountains is older than the Pleistocene. The glaciation of the Rocky Mountains during Wisconsin time only strengthened the division of already differentiated endemics in both, the western and eastern sectors of the Transition zone. The boundary between the Canadian and the Transition zone is not markedly distinct, that between Transition and Upper Austral zones is distinct.

The Upper Austral zone (Fig. 169UA) is divided by the Rocky Mountains into western and eastern sectors. This parallels the situation analogous in the Transition zone. The eastern sector is not considered here, because this sector was not studied within the scope of this project. The western sector is characterized by oak-pinon-juniper chapparal, and often referred to as Upper Sonoran region.

The Lower Austral zone (Fig. 169LA) is primarily developed in the southeastern United States. West of the Rocky Mountains, this zone occupies relatively small areas, characterized by semidesert, desert vegetation e.g., Larrea divaricata, and several species of Fouquieria. It is referred to as Lower Sonoran region (a distinction based on the amount of precipitation).

The composition of the fauna of British Columbia and Alberta and the present distribution of species indicate that in terms of post-glacial origin and affinities, the present fauna was most probably derived from the following four source areas (Fig. 168, areas 1, 2, 3, 4): This conclusion is primarily derived from the present distribution ranges of species (Figs. 88-167), and based on several assumptions. These are: a/ species occupy the maximal range available to it at any given time (this implies easy dispersal); b/ the species ecological tolerances or requirements did not change during the Pleistocene (cold adapted species are still cold adapted); c/ speciation on a large continental land mass is much slower than generally believed; and d/ glaciation as a process was gradual, and did not provide any new forces or habitats which may lead to speciation.

4.3.2 Source areas of post-glacial dispersal of Coccinellidae in western North America

Source area 1.- Beringian refugium and refugia thoroughout the Northern Rocky Mountains (ca. 3%). This element of the fauna is represented by the cold adapted, arctic-subarctic taxa, e.g., *Hippodamia arctica*, *Hippodamia ulkei*, *Coccinella fulgida*, *Anisosticta borealis*. These species, I believe, occupied the arctic and subarctic regions before glaciation, and with gradual cooling of the environment during glacial periods, the suitable habitats expanded southward, mainly along ranges of the Rocky Mountains. That the above species followed the habitat seems very likely. Many of the invaders from the north became stranded in the alpine zone at numerous places in the Rocky Mountains.

Source area 2.- Cordilleran refugia which included numerous southern Rocky Mountains refugia (ca. 12%). This element is represented by montane and alpine taxa, *e.g.*, *Hyperaspis jasperensis*, *Coccidula occidentalis*, *Calvia* (*Anisocalvia*) *quatuordecimguttata*, *Hippodamia americana*, *H. falcigera*, *H. oregonensis*, *H. washingtoni*, *Coccinella alta*. These species, I believe, survived the glaciation in nunatak areas thoroughout the Northern Rocky Mountains, and in alpine zone of Southern Rocky Mountains, and Sierra Nevada Mountains.

Areas 3-4.- Areas south of the ice-sheet, where the displaced British Columbia-Albertan fauna survived, and from where the basically southern taxa subsequently dispersed northward. This element represents the majority of species now found in both provinces (ca. 85%).

Table I summarizes composition of the fauna of western Canada and Alaska in reference to probable areas of post-glacial origin, (Fig. 168, areas 1,2,3,4), and lists the life zones presently occupied by species recorded. The

Palaearctic species recently introduced to North America are indicated by an asterisk (*). The species known from small areas in size are indicated by a zero (0). It should be noted that some species survived the Pleistocene glaciation in several areas. This is suggested by geographic variation in color and pattern, or both, in several species. The color/pattern variation is genetically determined, and thus geographically circumscribed variants imply genetic isolation. This can be explained by isolation of a population(s) from the main gene pool elsewhere, and implies that the Rocky Mountains effectively isolated several such populations during the Pleistocene glaciation on the west coast. For example, _Coccinella_ _californica_, _C._ _trifasciata_, _C._ _novemnotata_, all show geographic variation, (in reduction of spots on elytra), generally restricted to the west coast. The possible influence of oceanic climate does not cause the same effects on the Atlantic coast. Table II provides a summary of a total number of Coccinelidae within the life zones in western North America, and a cross-reference to postulated source areas of post-glacial dispersal.

TABLE I.

LIFE ZONES AND SOURCE AREAS OF POST-GLACIAL DISPERSAL OF COCCINELLIDAE IN WESTERN NORTH AMERICA

Species:	Life zone:	Source areas:
Coccinella fulgida	AA H C	1 2
Hippodamia ulkei	AA H C	1 2
Hippodamia arctica	AA H C	1 2
Hippodamia americana	AA H C	1 2
Hippodamia falcigera	AA H C	1 2
Mulsantina hudsonica	H C	1 2
Anisosticta borealis	AA H C	1 2
Hyperaspis jasperensis	AA	2 0
Anatis lecontei	H T UA	2
Coccinella alta	AA H C	2
Hippodamia oregonensis	AA H C T	2
Didion longulum	H T UA	3
Stethorus picipes	T UA	3
Scymnus (*S*.) *phelpsi*	T UA	3
Scymnus (*S*.) *caurinus*	T UA	3
Scymnus (*P*.) *postpinctus*	T UA	3
Scymnus (*P*.) *ardelio*	T UA	3
Scymnus (*P*.) *coniferarum*	T UA	3
Scymnus (*P*.) *marginicollis*	T UA	3
Scymnus (*P*.) *calaveras*	T UA	3
Nephus georgei	H C T	3
Hyperaspidius arcuatus	T UA	3

TABLE I.

LIFE ZONES AND SOURCE AREAS OF POST-GLACIAL DISPERSAL OF COCCINELLIDAE IN WESTERN NORTH AMERICA

Species:	Life zone:	Source areas:
Hyperaspis fastidiosa	T UA	3
Hyperaspis postica	T UA	3
Hyperaspis elliptica	T UA	3
Hyperaspis oregona	T UA	3
Hyperaspis simulatrix	T UA	3
Hyperaspis lanei	T UA	3
Hyperaspis dissoluta	T UA	3
Exochomus aethiops	T UA	3
Chilocorus tricyclus	T UA	3 0
Anatis rathvoni	T UA	3
Myzia subvittata	T UA	3
Myzia horni Crotch	T UA	3
Cycloneda polita	T UA	3
Coccinella californica	C T	3
Coccinella prolongata	T UA	3
Hippodamia caseyi	T UA	3
Hippodamia apicalis	T	3
Hippodamia moesta	T UA	3
Hippodamia lunatomaculata	C T	3
Hippodamia washingtoni	T	3
Psyllobora borealis	C T	3
Scymnus (*P.*) *lacustris*	C T	3 4
Coccidula occidentalis	H C T	3 4

TABLE I.

LIFE ZONES AND SOURCE AREAS OF POST-GLACIAL DISPERSAL OF COCCINELLIDAE IN WESTERN NORTH AMERICA

Species:	Life zone:	Source areas:
Anatis borealis	H C T	3 4
Calvia quatuordecimguttata	AA H C T	3 4
Adalia bipunctata	AA H C T UA	3 4
Coccinella monticola	AA H C T UA	3 4
Coccinella transversoguttata	AA H C T UA	3 4
Coccinella hieroglyphica	AA H C T UA	3 4
Coccinella trifasciata	AA H C T	3 4
Microweisea marginata	C T UA LA	4
Microweisea misella	C T UA LA	4
Didion nanus	T UA	4
Didion punctatus	T UA LA	4
Scymnus (*S*.) *apicanus*	T UA LA	4
Scymnus (*S*.) *paracanus*	T UA LA	4
Scymnus (*S*.) *opaculus*	T UA LA	4
Nephus ornatus	T UA	4
Nephus sordidus	T UA LA	4
Hyperaspidius vittigerus	T UA LA	4
Hyperaspis lateralis	T UA LA	4
Hyperaspis fimbriolata	T UA LA	4
Hyperaspis quadrivittata	T UA LA	4
Hyperaspis undulata	T UA LA	4
Hyperaspis lugubris	T UA LA	4
Brachiacantha ursina	T UA LA	4

TABLE I.

LIFE ZONES AND SOURCE AREAS OF POST-GLACIAL DISPERSAL OF COCCINELLIDAE IN WESTERN NORTH AMERICA

Species:	Life zone:	Source areas:
Chilocorus stigma	T UA LA	4
Brumoides septentrionis	T UA LA	4
Myzia pullata	C T UA	4
Olla v-nigrum	T UA LA	4
Coccinella novemnotata	T UA LA	4
Hippodamia convergens	T UA LA	4
Hippodamia glacialis	T UA LA	4
Hippodamia parenthesis	T UA LA	4
Hippodamia quinquesignata	T UA LA	4
Hippodamia sinuata	T UA LA	4
Macronaemia episcopalis	T UA LA	4
Hippodamia tredecimpunctata	T UA LA	4
Mulsantina picta	T UA LA	4
Anisosticta bitriangularis	T UA LA	4
Psyllobora vigintimaculata	T UA LA	4
Chilocorus hexacyclus	T	4 0
Scymnus (*P.*) *carri*	T	4 0
Hyperaspidius hercules	T	4 0
Scymnus (*P.*) *aquilonarius*	T UA	4 0
Stethorus punctillum *	T	0
Coccinella undecimpunctata *	T UA	0

Summary of Table I.

Totals:

Source areas (1)=7; (2)=11; (3)=41; (4)=44; (0)=8;

Life zones: AA=15; H=20; C=20; T=80; UA=66; LA=28.

TABLE II.

SUMMARY OF A NUMBER OF SPECIES OF COCCINELLIDAE WITHIN THE LIFE ZONES IN WESTERN NORTH AMERICA

Life zones

Source area	AA	H	C	T	UA	LA
1	6	7	7	---	---	---
2	9	11	9	2	1	---
3	6	10	13	41	30	---
4	6	8	12	44	36	28
0	---	---	-----	7	3	---
Total	27	36	41	94	70	28

4.4 Transmontane relationships between British Columbia and Alberta

One of the aspects of analyses of transmontane relationships between the fauna of British Columbia and Alberta was to compare distribution across the Rocky Mountains of closely related species, to evaluate the effectiveness of mountainous barriers: (1) to dispersal; and (2) in reference to speciation, *i.e.*, vicariance of species groups restricted to the west or east of the Rocky Mountain Trench.

4.4.1 Dispersal potential of coccinellids and vicariance

It is necessary to consider the potential of coccinellids to disperse across barriers, *e.g.*, large bodies of water, high mountain ranges, or vast areas of unsuitable habitats. In this respect, the power for dispersal of adults is exceedingly great. This ability is the result of strong flight muscles and functional wings. Adults of all species studied by me, were found to possess fully developed functional wings. Coccinellids in general are good and habitual fliers. The best example to illustrate this power of dispersal, I can provide, were the specimens of *Hippodamia convergens* captured in flight on the top of Mount Evans in Colorado (elevation 14,600 ft).

Four major pathways through the Rocky Mountains could have been used for eastward movement of western species or vice versa. These are (Fig. 193): A - Upper Peace River pass; B - Yellowhead pass; C - Banff National Park Pass; D - Crowsnest Pass; and E - Waterton National Park pass.

The Crowsnest Pass (D) appears to be the most important route for eastern species which have expanded their ranges westward, e.g., Chilocorus species. Distribution records of several species (Figs. 88-167) suggest that species with primarily western distribution, e.g., Anatis rathvoni, A. lecontei, Myzia oregona, M. horni (Figs. 127,129-131) penetrate eastward only in a narrow corridor in southwestern Alberta, Waterton National Park area (Fig. 193E). From erratic distribution records, I assume that these are incidental, most probably wind-blown strays. Other records, e.g., a single specimen of C. californica from Alberta (Fig. 142), are most likely specimens transported by human activity. Wingo (1952) reported specimens of this species from Iowa and Missouri, and suggested that these were carried there with shipments of fruits and vegetables. Brown (1962) reported a single specimen from Oklahoma. The transport by human activity is the most plausible explanation for single records of adults recorded far away from normal species range. No larvae were found at any of these localities.

The best documented example of vicariance is the species of the genus Chilocorus studied by Smith (1959, 1962, 1966). Smith (1966) studied hybridization between two sister-species, C. tricyclus (Saskatchewan, southern Alberta species), and C. hexacyclus (interior British Columbia species). C. tricyclus invaded C. hexacyclus territory through Crowsnest Pass (4,463 ft; 1361 m) borne on prevailing westerly winds. Both species hybridize in a narrow zone of the Crowsnest River valley (Fig. 193E). Smith (1966) estimated segregational sterility in this zone to be ca. 40%.

In the case of Psyllobora borealis, and P. vigintimaculata the vicariance is more difficult to evaluate because the two species are sympatric. Nonetheless, P. borealis is restricted to the west of the Rocky Mountains (Fig. 167), and P. vigintimaculata ranges widely in North America (Fig. 166). The two overlap in their distribution over the entire range of P. borealis. No introgression or hybridization was reported in the literature, and from my observations I am reluctant to suggest that it exists. The genus Psyllobora is most probably of Tertiary origin, suggested by the relatively high number of species included, and there is not any need to invoke the hypothesis that the Pleistocene glaciation has had anything to do with speciation in this, primarily Middle American genus. In other genera, vicariance is not possible to evaluate, because relationships among species is not established.

The Rocky Mountains are not a significant dispersal barrier for species now isolated on either side of the Rocky Mountain Trench. A relatively large number of species widely range in North America, and the Rocky Mountains seem to have little effect on their distribution. From this I assume that, given the same potential for dispersal to all species, there are other factors involved, which prevent the western species to extend their distribution ranges eastward. This is clearly evident from the distribution maps (Figs. 88-167), a map of life zones (Fig. 169), and Tables I and II. For example, the Canadian, Hudsonian, or Transition zones, which are available on both sides of the Rocky Mountains, are occupied by some species restricted to only one side of the mountains. Some of these factors are ecological, but other (not understood by me) must be involved also. It is significant to note that the widely ranging species exhibit pronounced geographic variation in, color, color pattern or both. The only passage where western species occasionally invade areas east of the Rockies is the Waterton National Park area (Fig. 193F). The particular combination of physiographic features in the Waterton National Park area results in a distinctive local climate. Waterton has the warmest winters in Alberta, the highest snow and rain precipitation. The effect of strong, southwesterly prevailing winds is most noticeable on trees. For the other mountain passes (Fig. 193A, B, C) there is no evidence to suggest that they have served as important dispersal routes between the fauna of Alberta and British Columbia. Penetration of eastern species into British Columbia territory is well documented (Smith, 1966) for several species, e.g., *Chilocorus tricyclus*, *C. hexacylus* complex (Figs. 122-124). The fact that the ranges of these species are parapatric, and the two hybridize in the suture zone of contact, this leads me to suggestion that the differentiation process between *C. tricyclus*, and *C. hexacyclus* is not completed yet, and therefore of recent origin. Thus, species of this group are an exception to the general statement made earlier, and have evolved (differentiated) as a direct result of the Pleistocene glaciation.

4.5 Conclusions

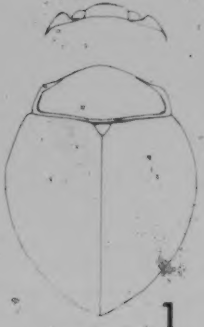
1.- The coccinellid portion of the beetle fauna of western Canada and Alaska is represented by 88 recorded species. Twenty five species are recorded from Alaska, Yukon and Northwest Territories (north of 60° parallel) Sixty four species are recorded from Alberta, and 75 from British Columbia (87 including species not studied, but reliably recorded from southern British Columbia). Of these, nine species represent the Palaearctic element of the fauna (introduced or circumpolar Holarctic species). Three species are recorded as arctic-subarctic endemic species, known from northern North America only. Four species, recorded as alpine endemics, are restricted to the alpine zone of the Rocky Mountains. Thirty five species are restricted to the west of the Rocky Mountains. Only five species are recorded as species endemic to the prairie/grassland region, southeast of the Rocky Mountains. The remaining species range widely in North America, and in some instances also Middle and South America. It is significant to note, that the majority of widely ranging species are polymorphic, with pronounced geographic variation in color, maculation pattern, or both. Based on the above composition of this fauna, and assuming much slower evolutionary rates than generally believed, I postulate that the present coccinellid fauna of western Canada and Alaska is most probably derived post-glacially from the North American Tertiary fauna. This is suggested by a pronounced continental endemism at the species level, of the 88 species recorded, 75 (84.4%) are strictly North American species. At generic level, the affinity of the North American fauna is primarily with the Palaearctic Region. More than 71% genus-group taxa are common to the Holarctic Region.

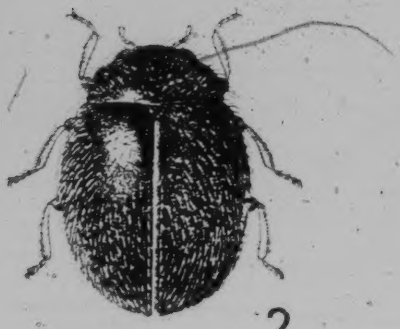
2.- The post-glacial source areas (Fig. 168), from which the present fauna is derived, are postulated to be from areas south of the southern limits of glaciation (ca. 85%), with minor refugial elements which survived glaciation _in situ_, _i.e._, Cordilleran, Rocky Mountains refugia (ca. 12%), and the Beringian refugium (ca. 3%).

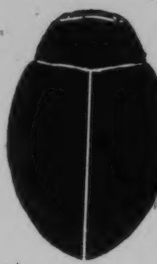
3.- The Rocky Montains are not an effective barrier to dispersal of coccinellids. The adults of all species studied possessed fully developed functional wings, and coccinellids are generally strong and habitual fliers, capable to disperse by flight over the highest peaks of the Rocky Mountains. The endemism of some species restricted to areas on either side of the Rocky Mountains is most probably controlled by ecological and other factors. This hypothesis is supported by the inability of species to establish breeding populations when transported across the mountains with shipments of fruits and vegetables. The Rocky Mountains played a significant role in the development of the North American coccinellid fauna, mainly as a source of new habitats. The new habitats were created not only with the orogenesis of the Rocky Mountains themselves, but also as a result of altered weather patterns in most of the western North America. The influence of the Pleistocene glaciation on the composition of the coccinellid fauna was relatively insignificant. The effects of glaciation on the distribution were profound.

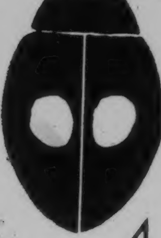
Habitus and maculation of:

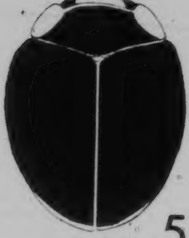
Fig. 1. *Microweisea misella* (LeConte)
Fig. 2. *Stethorus picipes* Casey
Fig. 3. *Didion longulum* Casey
Fig. 4. *Didion punctatum* (Melsheimer)
Fig. 5. *Scymnus* (*Scymnus*) *apicanus* Chapin
Fig. 5. *Scymnus* (*Scymnus*) *paracanus* Chapin
Fig. 6. *Scymnus* (*Pullus*) *postpinctus* Casey
Fig. 7. *Scymnus* (*Pullus*) *lacustris* LeConte
Fig. 7. *Scymnus* (*Pullus*) *calaveras* Casey
Fig. 8. *Nephus georgei* Weise
Fig. 9. *Nephus* (*Nephus*) *ornatus* LeConte
Fig. 10. *Scymnus* (*Pullus*) *coniferarum* Crotch
Fig. 11. *Scymnus* (*Pullus*) *ardelio* Horn
Fig. 12. *Hyperaspidius hercules*, new species
Fig. 12. *Hyperaspidius vittigerus* (LeConte)

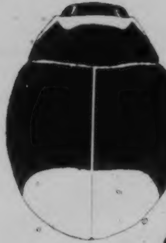

1

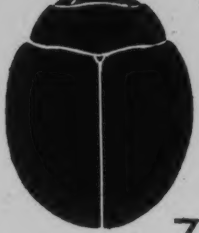

2

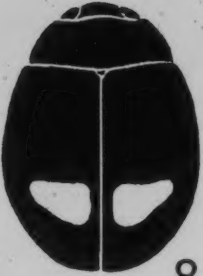

3

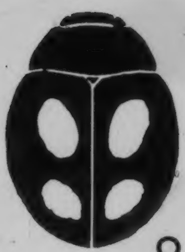

4

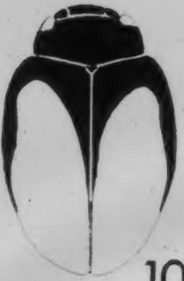

5

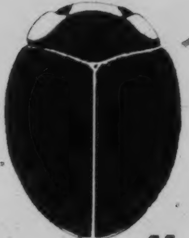

6

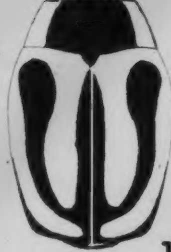

7


8


9


10


11


12

Habitus and maculation of:

Fig. 13. _Hyperaspis_ _fastidiosa_ Casey

Fig. 14. _Hyperaspis_ _fimbriolata_ (Melsheimer)

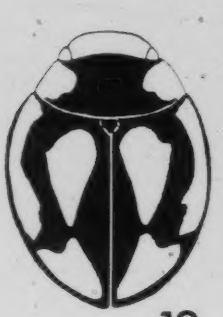
Fig. 15. _Hyperaspis_ _dissoluta_ Crotch

Fig. 16. _Hyperaspidius_ _arcuatus_ (LeConte)

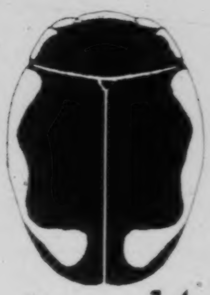
Fig. 17. _Hyperaspis_ _lateralis_ Mulsant

Fig. 18. _Hyperaspis_ _lateralis_ Mulsant

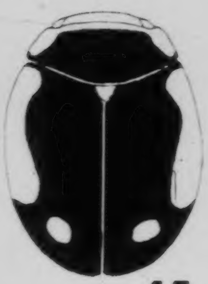
Fig. 19. _Hyperaspis_ _simulatrix_ Dobzhansky



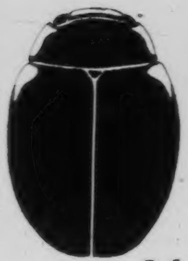
13



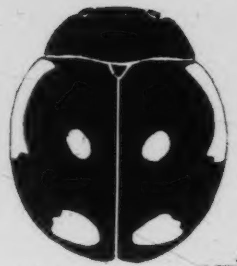
14



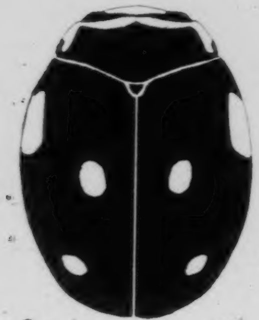
15



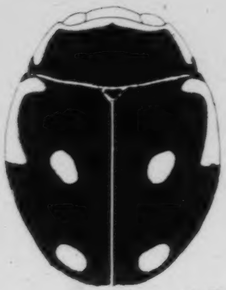
16



17



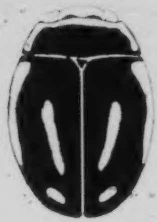
18

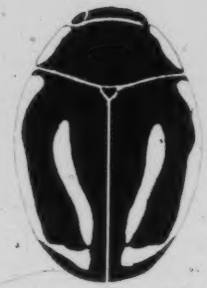


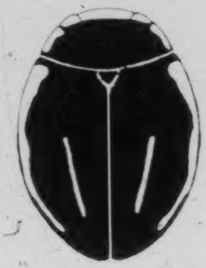
19

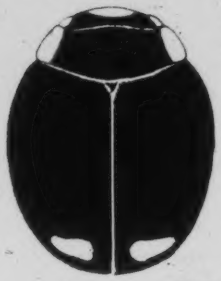
Habitus and maculation of:

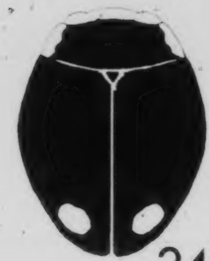
Fig. 20. *Hyperaspis oregona* Dobzhansky
Fig. 21. *Hyperaspis annexa* LeConte
Fig. 22. *Hyperaspis quadrivittata* LeConte
Fig. 23. *Hyperaspis elliptica* Casey
Fig. 24. *Hyperaspis postica* LeConte
Fig. 25. *Hyperaspis undulata* (Say)
Fig. 26. *Hyperaspis lanei* Hatch
Fig. 27. *Hyperaspis simulatrix* Dobzhansky
Fig. 28. *Hyperaspis jasperensis*, new species
Fig. 29. *Hyperaspis lugubris* (Randall)
Fig. 30. *Hyperaspis levrati* Mulsant
Fig. 31. *Brachiacantha ursina* (Fabricius)
Fig. 32. *Exochomus aethiops* (Bland)
Fig. 33. *Chilocorus stigma* (Say)
Fig. 34. *Brumoides septentrionis* (Weise)
Fig. 35. *Coccidula occidentalis* Horn

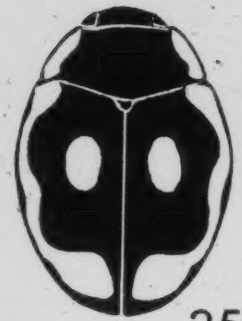

20

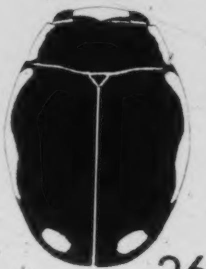

21

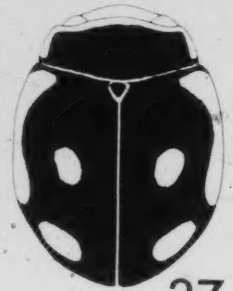

22

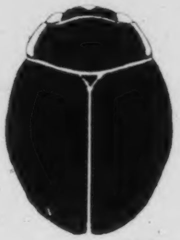

23

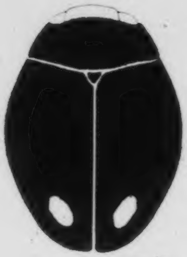

24

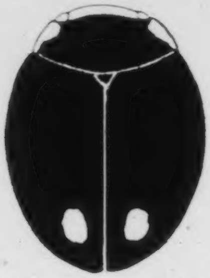

25

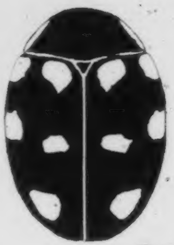

26

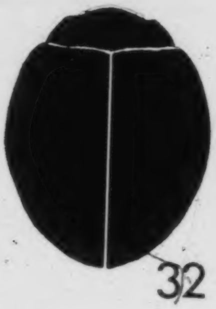

27

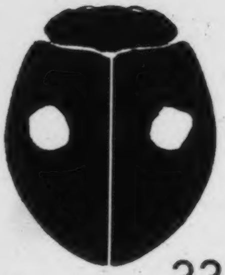

28

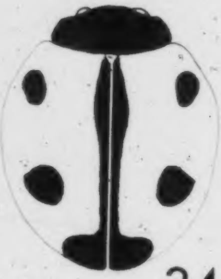

29

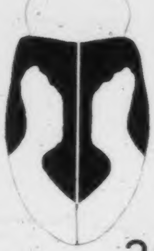

30


31


32


33


34


35

Habitus and maculation of:

Fig. 36. Anatis borealis, new species

Fig. 37. Anatis lecontei Casey

Fig. 38. Anatis rathvoni (LeConte)

Fig. 39. Myzia subvittata (Mulsant)

Fig. 40. Myzia horni Crotch

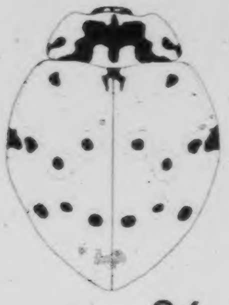
Fig. 41. Myzia pullata (Say)

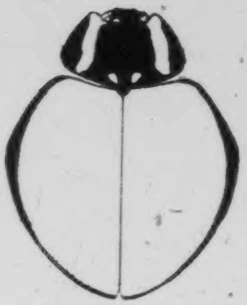
Fig. 42, 42A, 42B. Calvia quatuordecimguttata (Linnaeus)

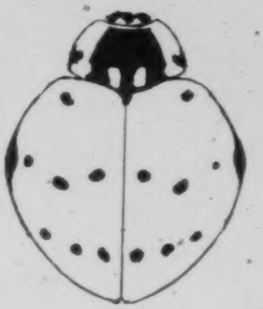
Fig. 43, 43A, 43B. Adalia bipunctata (Linnaeus)

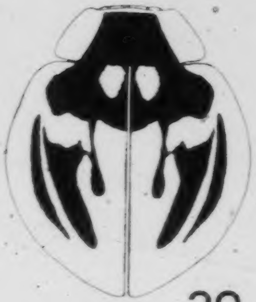
Fig. 44. Olla v-nigrum (Mulsant)

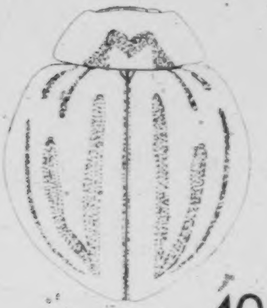
Fig. 45. Cycloneda polita Casey

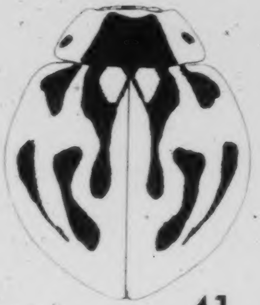

36

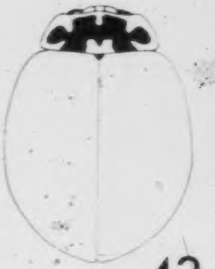

37

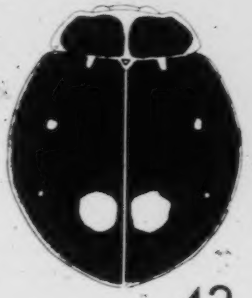

38

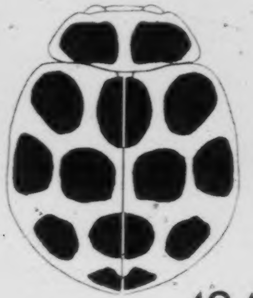

39

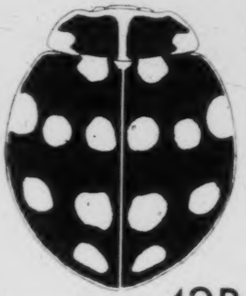

40

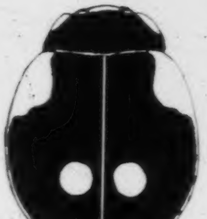

41

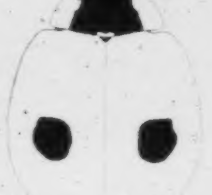

43

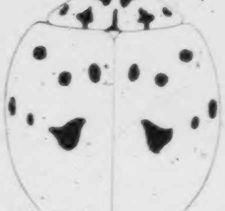

42

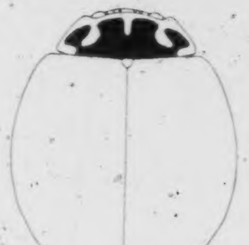

42A


42B


43A


43B


44


45

Habitus and maculation of:

Fig. 46. *Coccinella alta* Brown

Fig. 47. *Coccinella novemnotata* Herbst

Fig. 48. *Coccinella undecimpunctata* Linnaeus

Fig. 49. *Coccinella prolongata* Crotch

Fig. 50. *Coccinella transversoguttata* Mulsant

Fig. 51. *Coccinella californica* Mannerheim

Fig. 52. *Coccinella trifasciata* Linnaeus

Fig. 53. *Coccinella fulgida* Watson

Fig. 54. *Coccinella californica* Mannerheim

Fig. 55. *Hippodamia arctica* (Schneider)

Fig. 56. *Hippodamia americana* Crotch

Fig. 57. *Hippodamia ulkei* (Crotch)

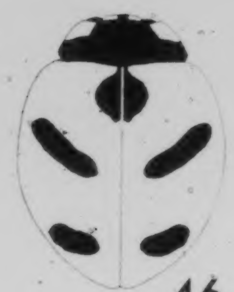
Fig. 58. *Coccinella hieroglyphica* Linnaeus

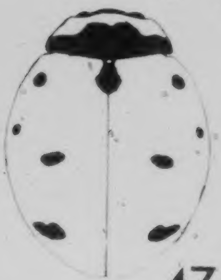
Fig. 59. *Hippodamia falcigera* Crotch

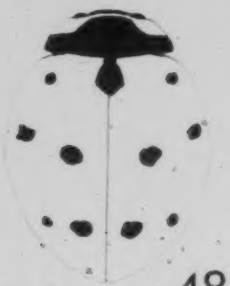
Fig. 60. *Hippodamia caseyi* Johnson

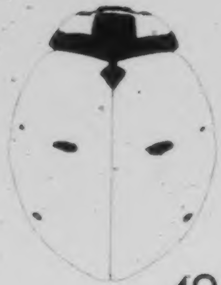
Fig. 61. *Hippodamia convergens* Guérin-Méneville

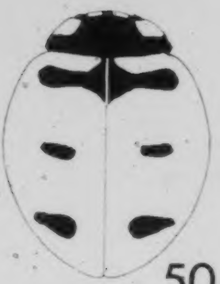
Fig. 62. *Hippodamia apicalis* Casey

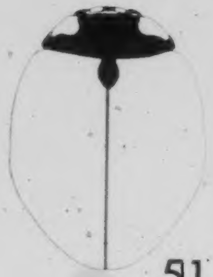

46

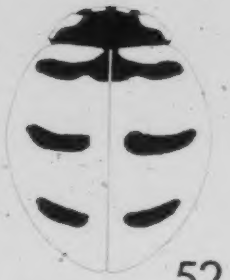

47

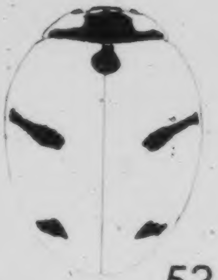

48

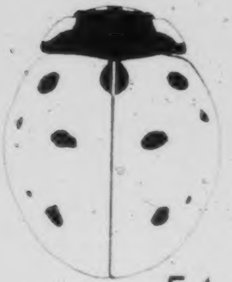

49

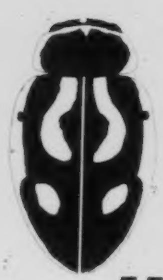

50

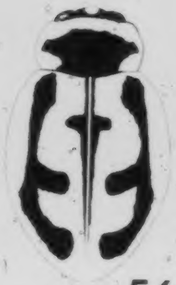

51

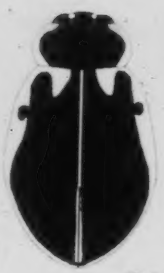

52

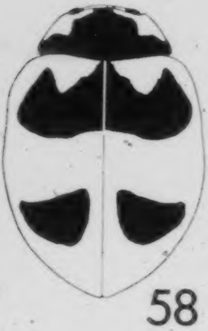

53

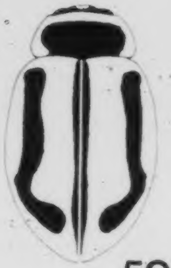

54

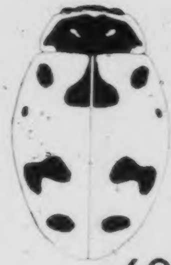

55

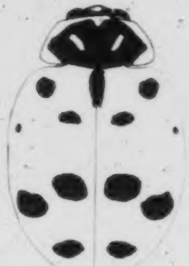

56

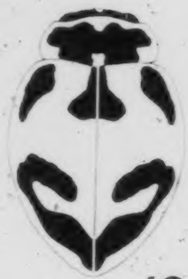

57


58


59

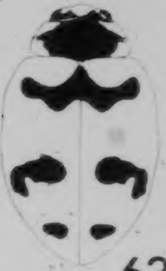

60

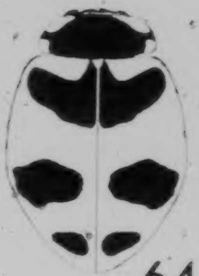

61

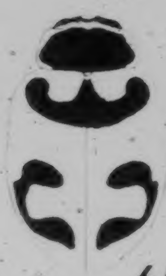

62

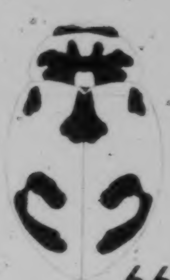
Habitus and maculation of:

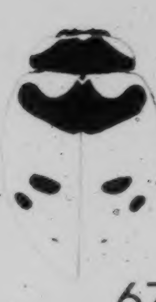
Fig. 63. *Hippodamia glacialis* (Fabricius)
Fig. 64. *Hippodamia moesta* LeConte
Fig. 65. *Hippodamia oregonensis* Crotch
Fig. 66. *Hippodamia parenthesis* (Say)
Fig. 67. *Hippodamia quinquesignata* (Kirby)
Fig. 68. *Hippodamia sinuata* Mulsant
Fig. 69. *Hippodamia washingtoni* Timberlake
Fig. 70. *Hippodamia tredecimpunctata* (Linnaeus)
Fig. 71, 75. *Anisosticta bitriangularis* (Say)
Fig. 72. *Mulsantina hudsonica* (Casey)
Fig. 73. *Mulsantina picta* (Randall)
Fig. 74. *Macronaemia episcopalis* (Kirby)
Fig. 76. *Anisosticta borealis* Timberlake
Fig. 77. *Psyllobora vigintimaculata* (Say)
Fig. 78. *Psyllobora borealis* Casey

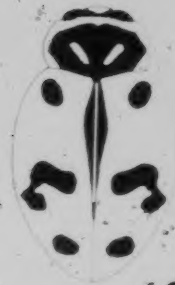

63

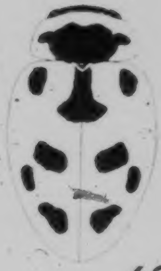

64

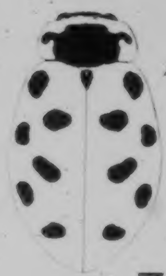

65

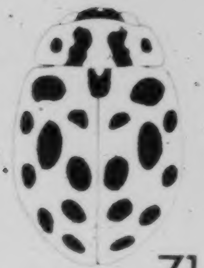

66

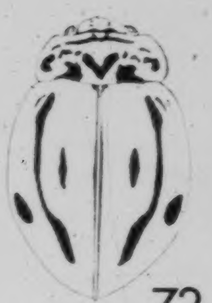

67

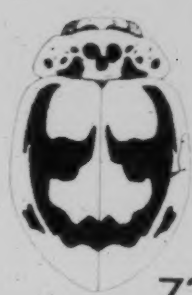

68

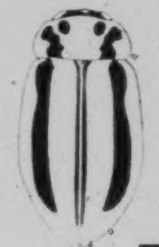

69

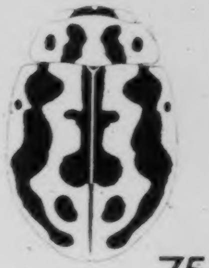

70

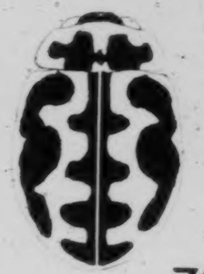

71

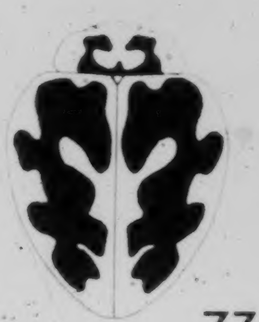

72

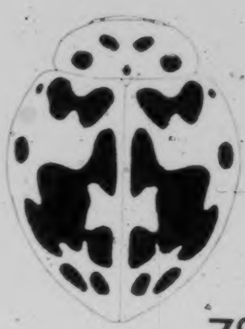

73


74


75


76


77


78

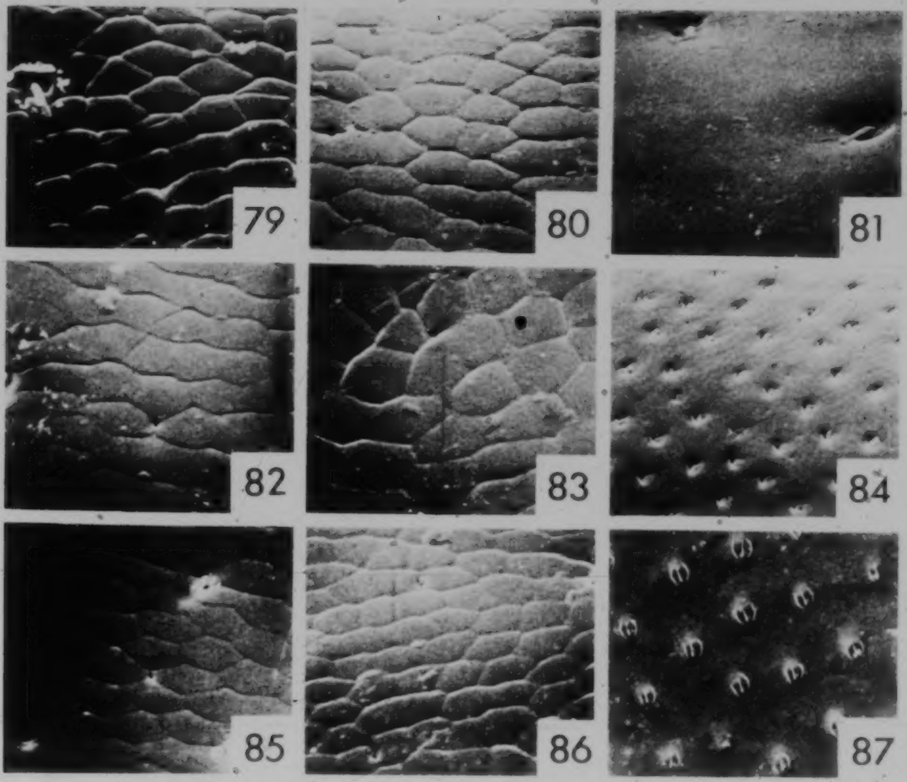


Fig. 79-86. Pronotal microsculpture. Fig. 87. Elytral microsculpture. Fig. 79. *Coccinella transversoguttata* Mulsant; Fig. 80. *Calvia decemguttata* (Linnaeus); Fig. 81. *Calvia* (*Anisocalvia*) *quatuordecimguttata* (Linnaeus); Fig. 82. *Adalia bipunctata* (Linnaeus); Fig. 83. *Hippodamia tredecimpunctata* (Linnaeus); Fig. 84. *Hyperaspis* sp., Fig. 85. *Adalia bipunctata* (Linnaeus); Fig. 86. *Olla v-nigrum* (Mulsant);=*O. abdominalis* (Say); Fig. 87. *Hyperaspis* sp.,

Scale: Fig. 79-83, 85-86, (6 mm = 5µ).
Fig. 84,87; (6 mm = 20µ).

Nearctic distribution of:

Fig. 88. Microweisea misella (LeConte)

Fig. 89. Didion longulum Casey •

Fig. 89. Didion punctatum (Melsheimer) •

Fig. 90. Stethorus punctillum Weise

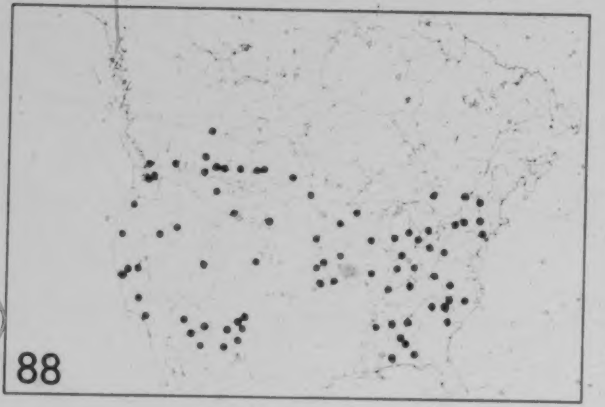
Fig. 90. Stethorus picipes Casey

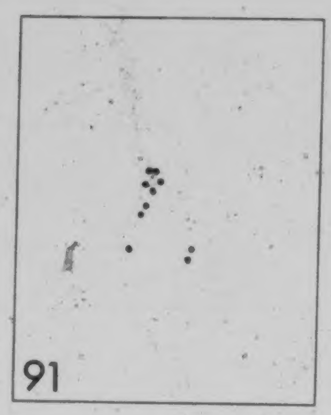
Fig. 91. Scymnus (Scymnus) phelpsi Crotch

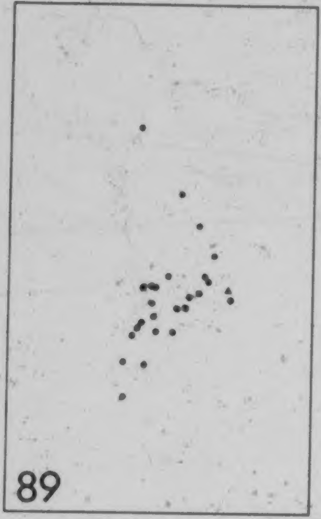
Fig. 92. Scymnus (Scymnus) apicanus Chapin

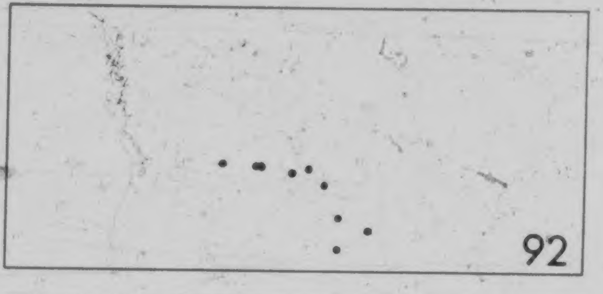
Fig. 93. Scymnus (Scymnus) paracanus Chapin

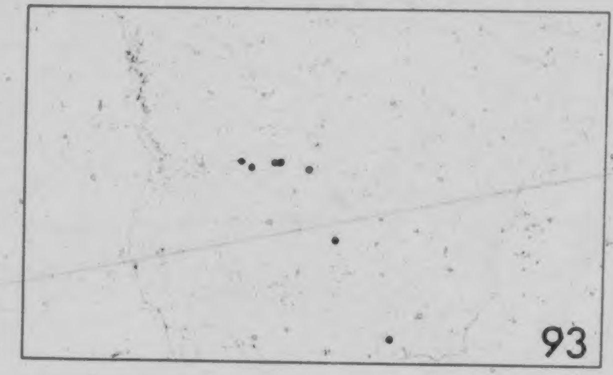
Fig. 94. Scymnus (Scymnus) opaculus Horn

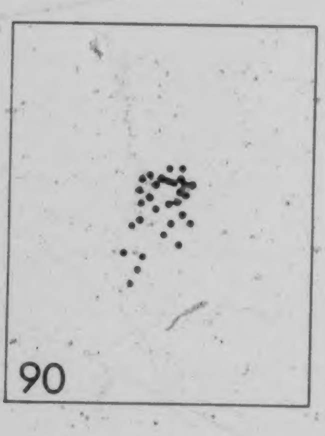

88

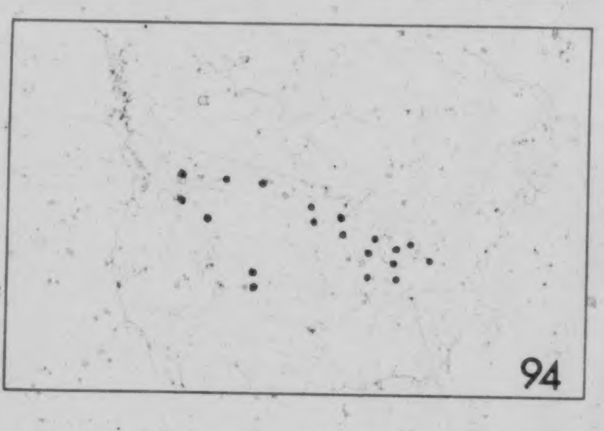

91


89


92


93


90


94

Nearctic distribution of:

Fig. 95. _Scymnus_ (_Pullus_) _postpinctus_ Casey

Fig. 96. _Scymnus_ (_Pullus_) _aquilonarius_ Gordon

Fig. 96. _Scymnus_ (_Pullus_) _carri_ Gordon

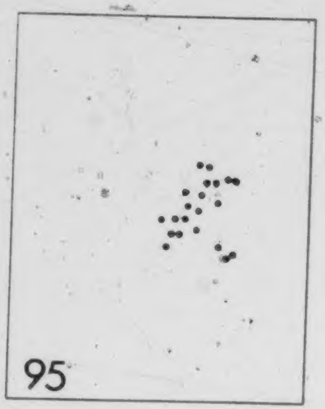
Fig. 97. _Scymnus_ (_Pullus_) _ardelio_ Horn

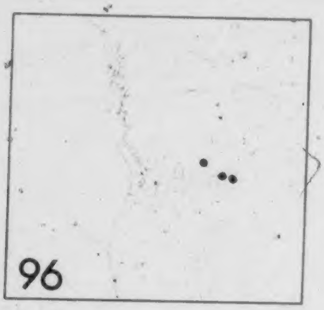
Fig. 98. _Scymnus_ (_Pullus_) _coniferarum_ Crotch

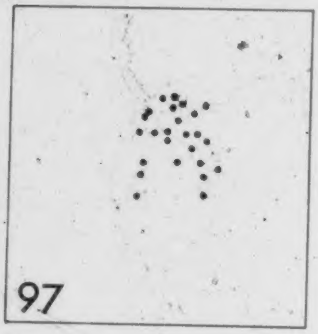
Fig. 99. _Scymnus_ (_Pullus_) _lacustris_ LeConte

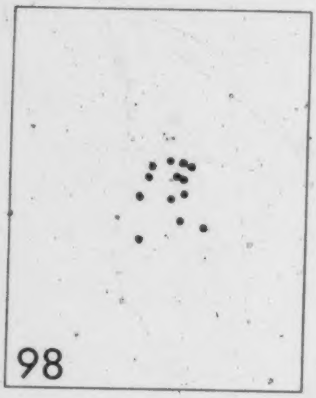
Fig. 100. _Scymnus_ (_Pullus_) _marginicollis_ Mannerheim

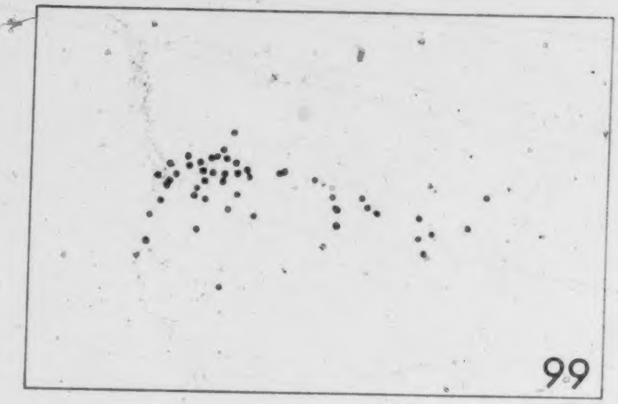
Fig. 101. _Scymnus_ (_Pullus_) _calaveras_ Casey

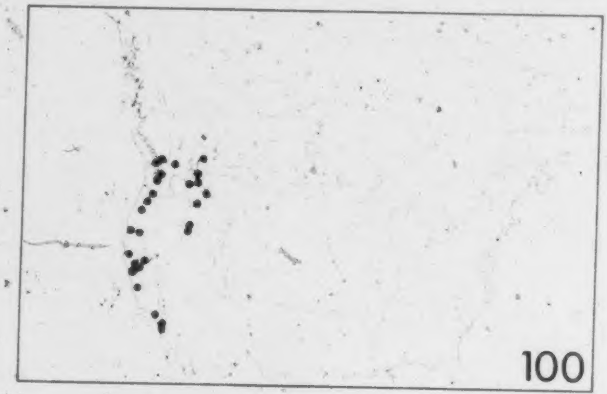

95

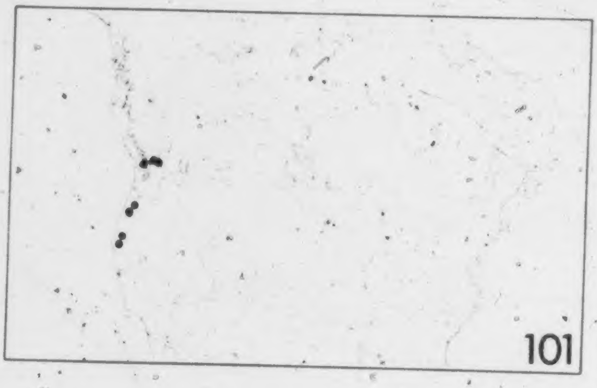

96


97


98


99


100


101

Nearctic distribution of:

Fig. 102. Nephus georgei Weise

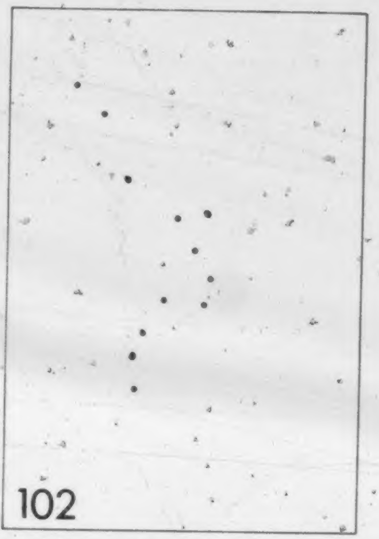
Fig. 103. Hyperaspidius arcuatus (LeConte)

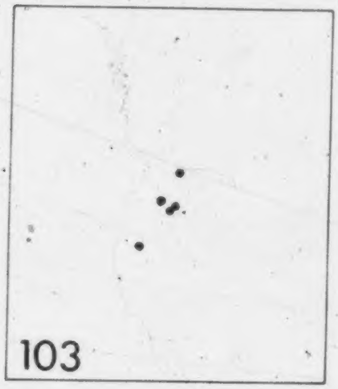
Fig. 104. Hyperaspidius hercules, new species

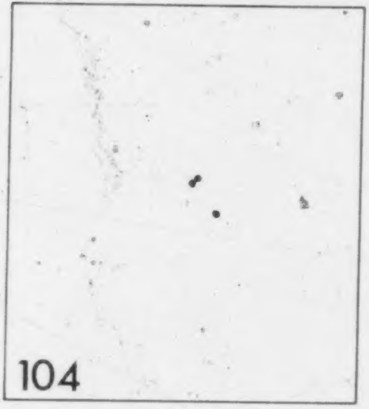
Fig. 105. Nephus ornatus LeConte

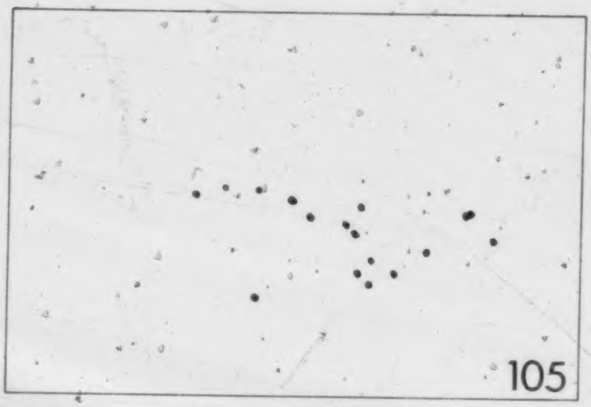
Fig. 106. Nephus sordidus Horn

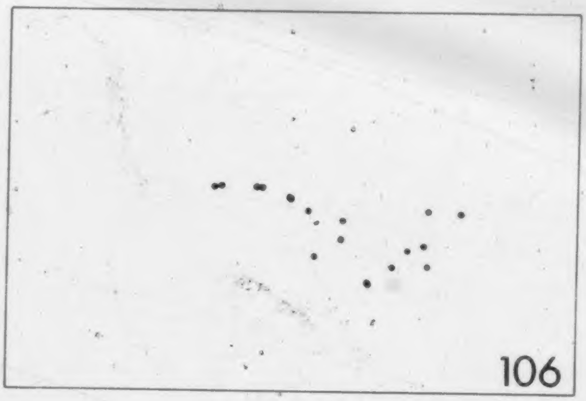
Fig. 107. Hyperaspidius vittigerus (LeConte)

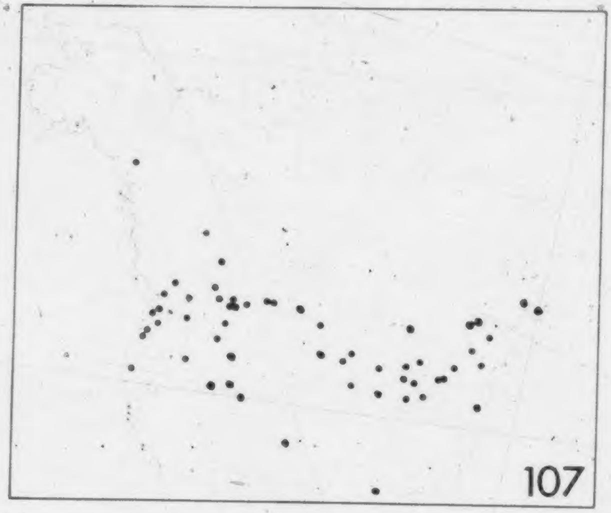

102


103


104


105


106


107

Nearctic distribution of:

Fig. 108. Hyperaspis lateralis Mulsant

Fig. 109. Hyperaspis fastidiosa Casey

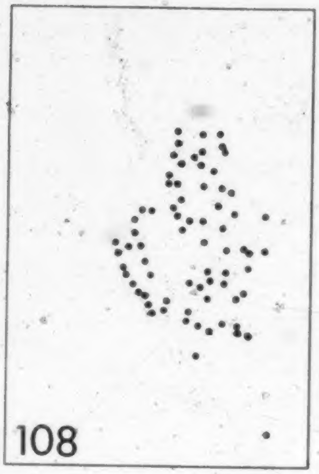
Fig. 110. Hyperaspis postica LeConte

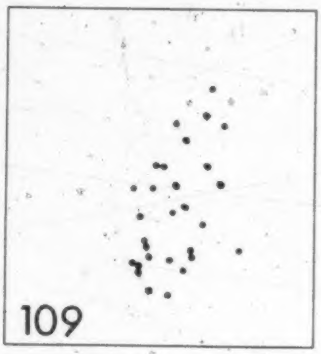
Fig. 111. Hyperaspis elliptica Casey

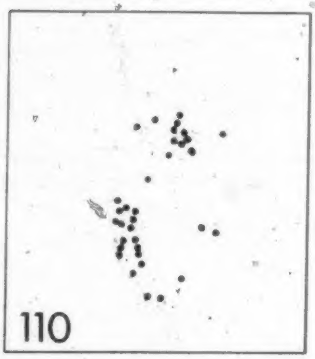
Fig. 112. Hyperaspis fimbriolata (Melsheimer)

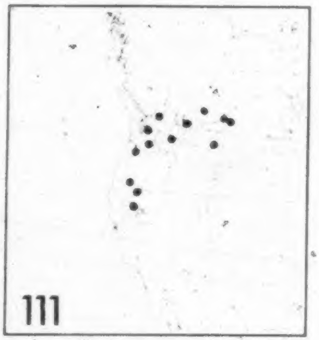
Fig. 113. Hyperaspis quadrivittata LeConte

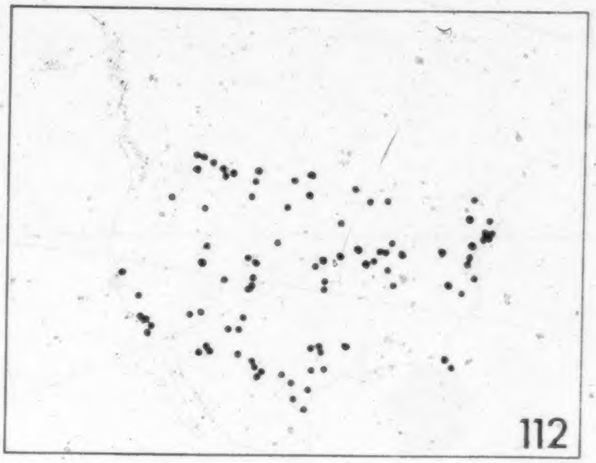
Fig. 114. Hyperaspis undulata (Say)

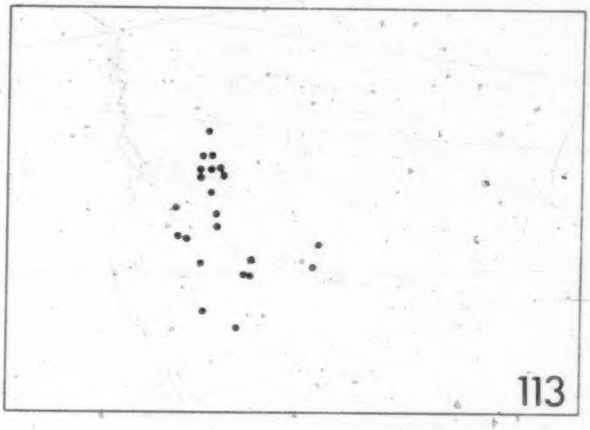

108

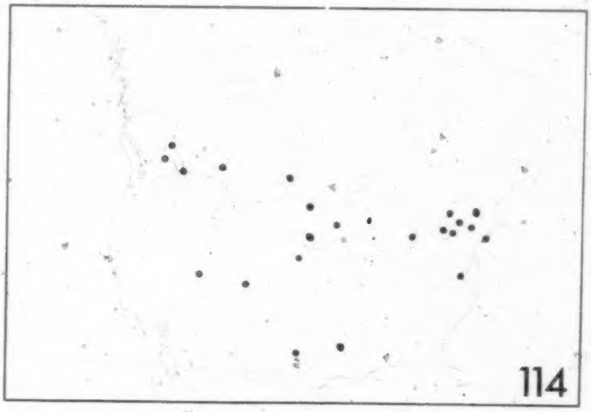

109


110


111


112


113


114

Nearctic distribution of:

Fig. 115. Hyperaspis oregona Dobzhansky

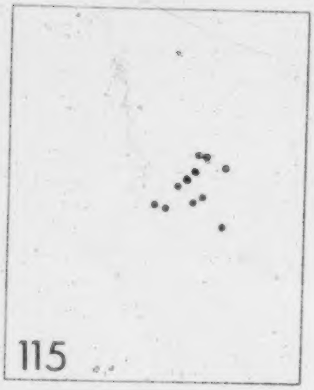
Fig. 116. Hyperaspis simulatrix Dobzhansky

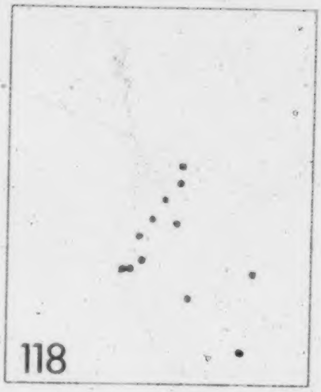
Fig. 117. Hyperaspis lanei Hatch

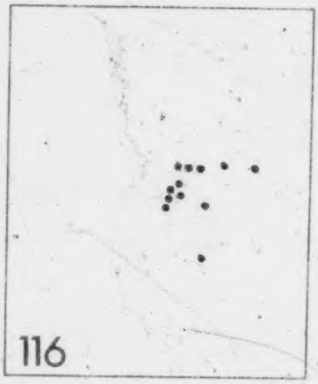
Fig. 118. Hyperaspis dissoluta Crotch

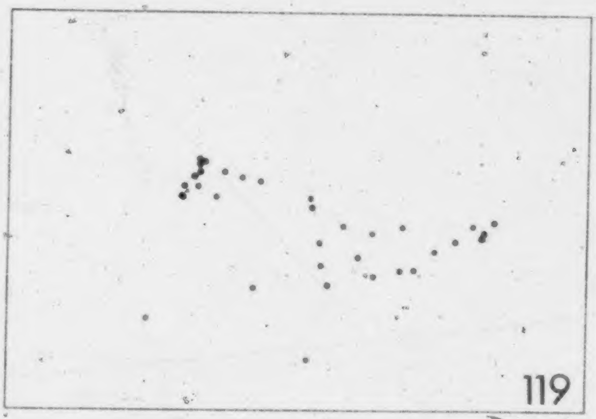
Fig. 119. Hyperaspis lugubris (Randall)

Fig. 120. Brachiacantha ursina (Fabricius)

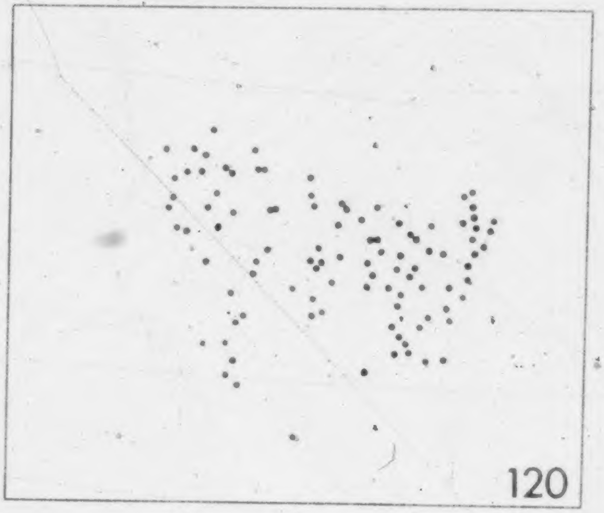

115


118


116


119

117


120

Nearctic distribution of:

Fig. 121. *Exochomus aethiops* (Bland).

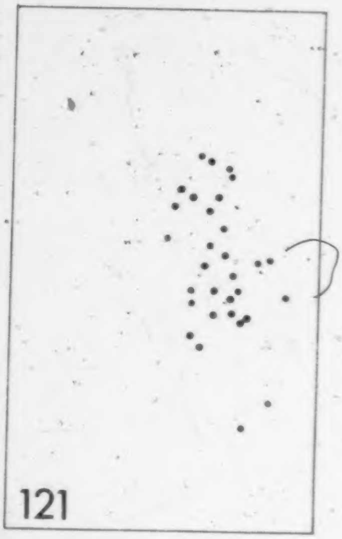
Fig. 122. *Chilocorus tricyclus* Smith

Fig. 123. *Chilocorus hexacyclus* Smith

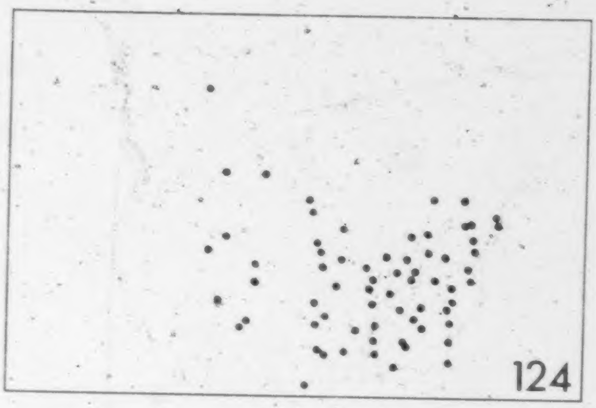
Fig. 124. *Chilocorus stigma* (Say)

Fig. 125. *Brumoides septentrionis* (Weise)

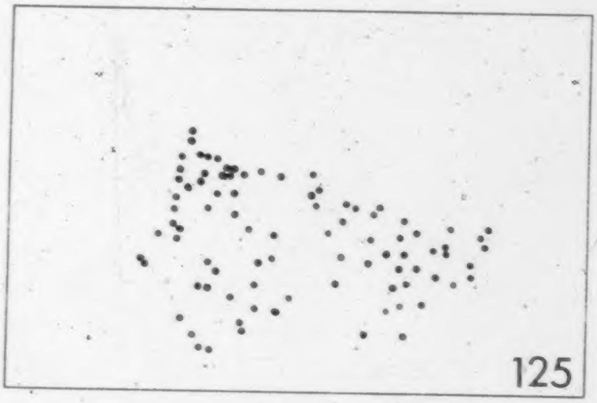
Fig. 126. *Coccidula occidentalis* Horn



121

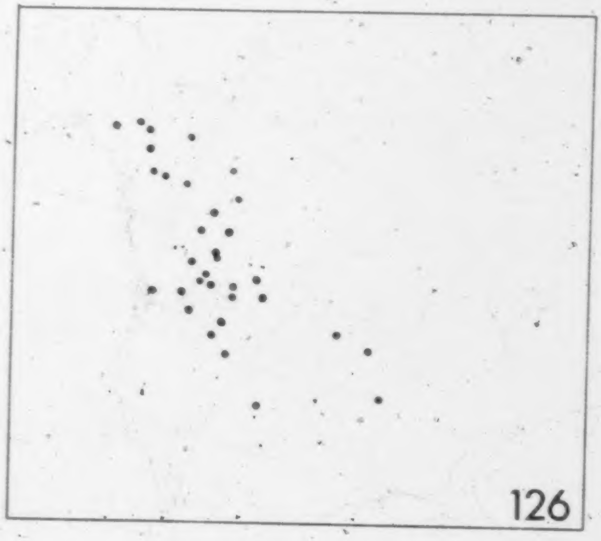


124

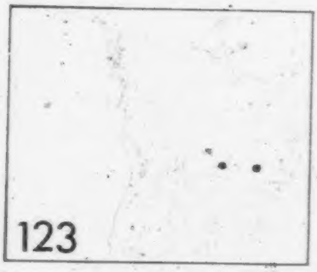


125

122



126



123

Nearctic distribution of:

Fig. 127. *Anatis lecontei* Casey

Fig. 128. *Anatis borealis*, new species

Fig. 129. *Anatis rathvoni* (LeConte)

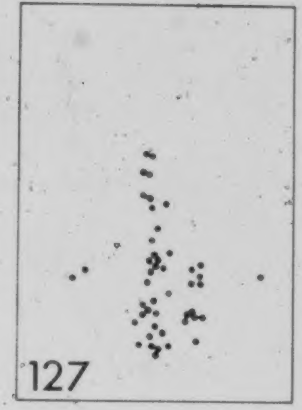
Fig. 130. *Myzia subvittata* (Mulsant)

Fig. 131. *Myzia horni* Crotch

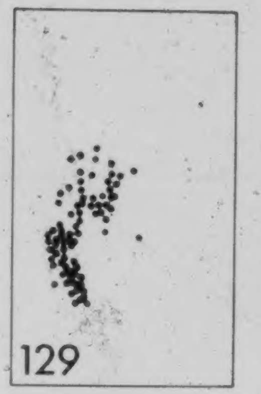
Fig. 132. *Myzia pullata* (Say)

Fig. 133. *Calvia quatuordecimguttata* (Linnaeus)

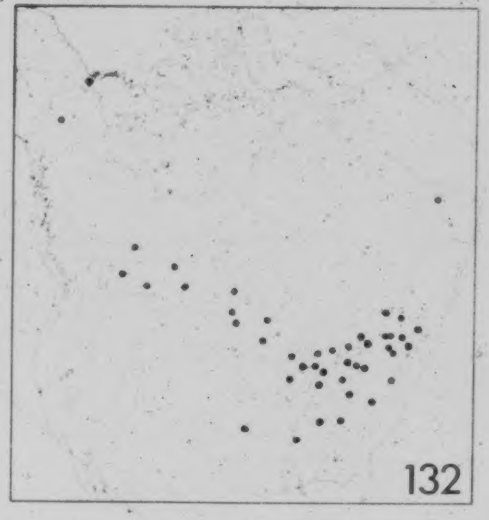
Fig. 134. *Adalia bipunctata* (Linnaeus)



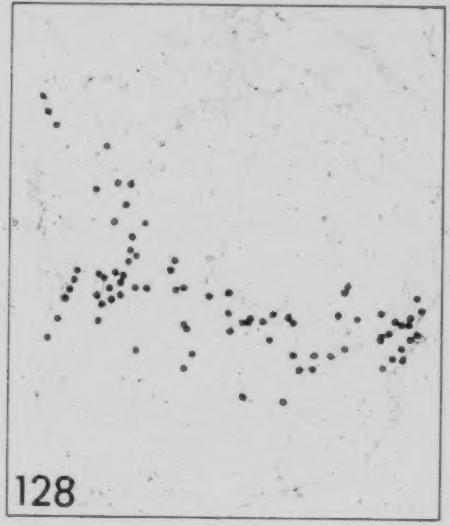
127



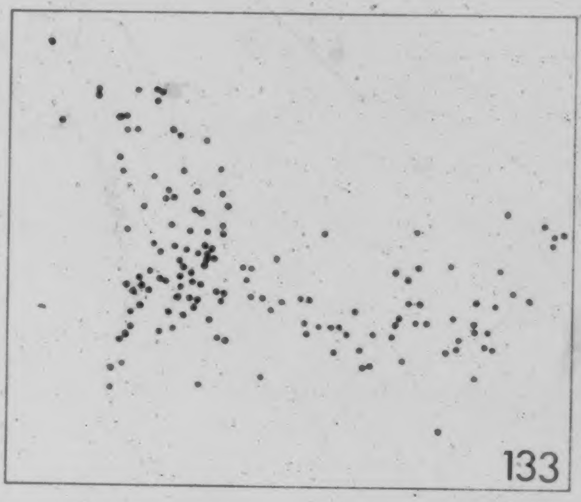
129



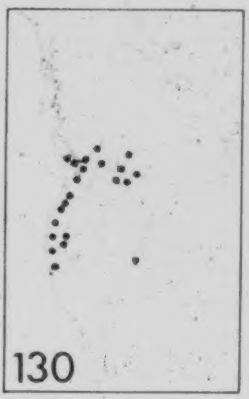
132



128

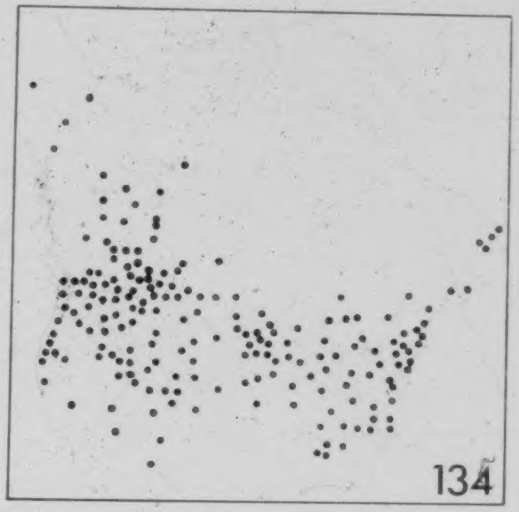


133



130

131



134

Nearctic distribution of:

Fig. 135. Olla v-nigrum (Mulsant)

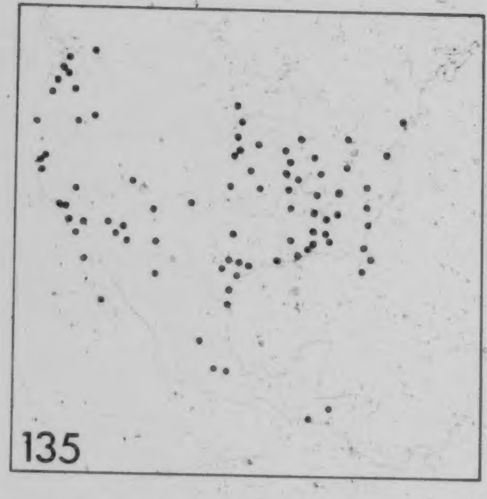
Fig. 136. Cycloneda polita Casey

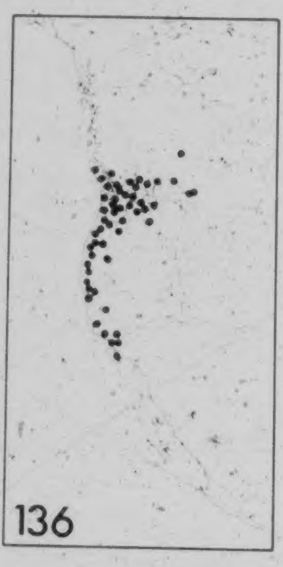
Fig. 137. Coccinella alta Brown

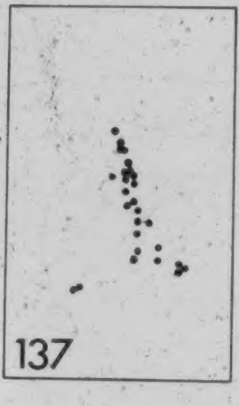
Fig. 138. Coccinella monticola Mulsant

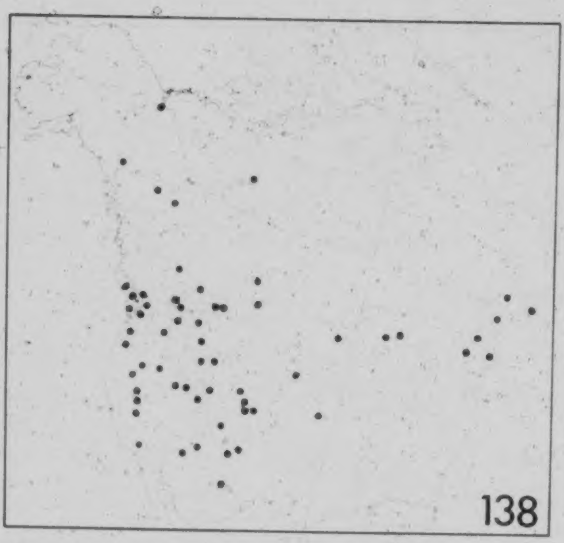
Fig. 139. Coccinella transversoguttata Falderman

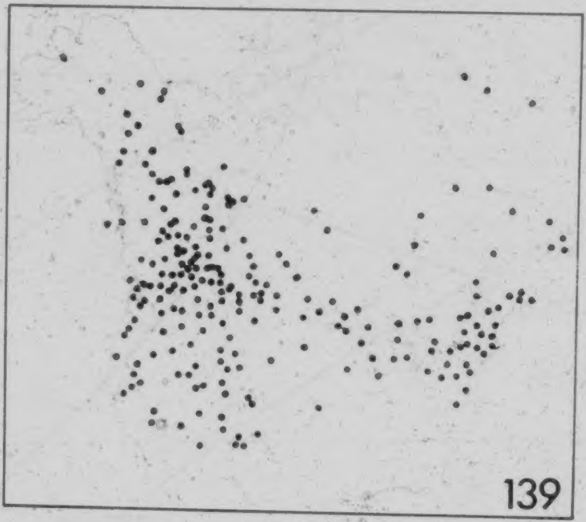
Fig. 140. Coccinella hieroglyphica Linnaeus

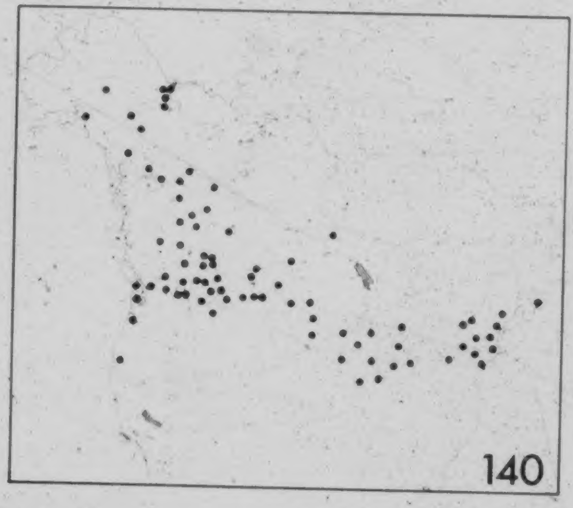

135


136


137


138


139


140

Nearctic distribution of:

Fig. 141. Coccinella novemnotata Herbst

Fig. 142. Coccinella californica Mannerheim

Fig. 143. Coccinella prolongata Crotch

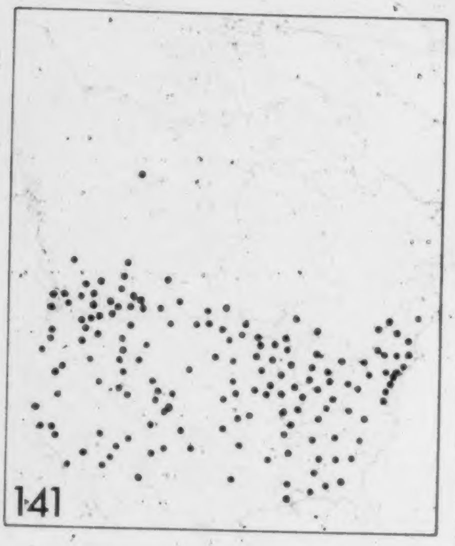
Fig. 144. Coccinella fulgida Watson ●

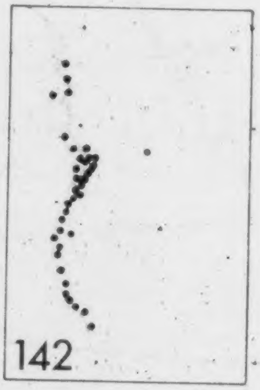
Fig. 144. Coccinella undecimpunctata Linnaeus ▲

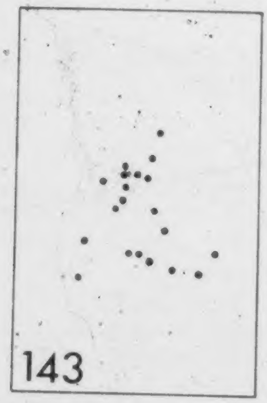
Fig. 145. Coccinella trifasciata Linnaeus

Fig. 146. Hippodamia ulkei (Crotch)

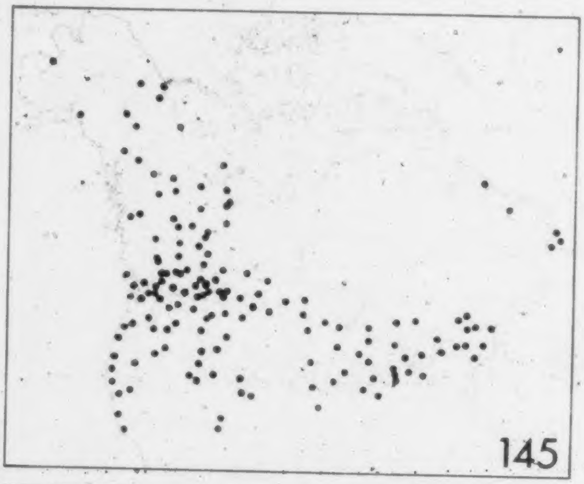
Fig. 147. Hippodamia arctica (Schneider)


141

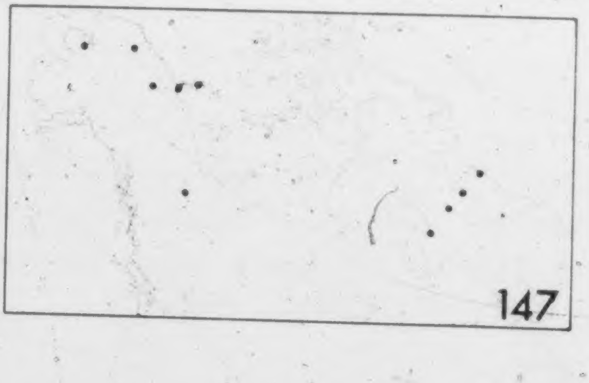

142


143

144


145

146


147

Nearctic distribution of:

Fig. 148. Hippodamia americana Crotch

Fig. 149. Hippodamia caseyi Johnson

Fig. 150. Hippodamia apicalis Casey

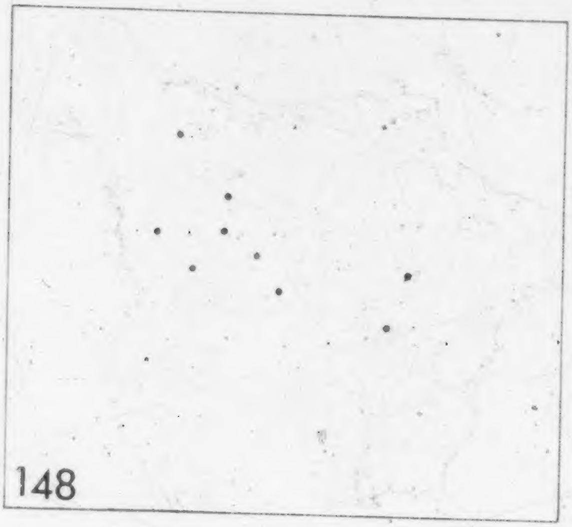
Fig. 151. Hippodamia moesta LeConte

Fig. 152. Hippodamia convergens Guérin-Méneville

Fig. 153. Hippodamia falcigera Crotch

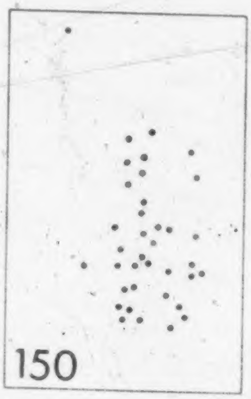
Fig. 154. Hippodamia oregonensis Crotch

Fig. 155. Hippodamia glacialis (Fabricius)

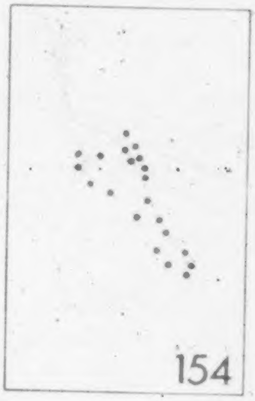

148

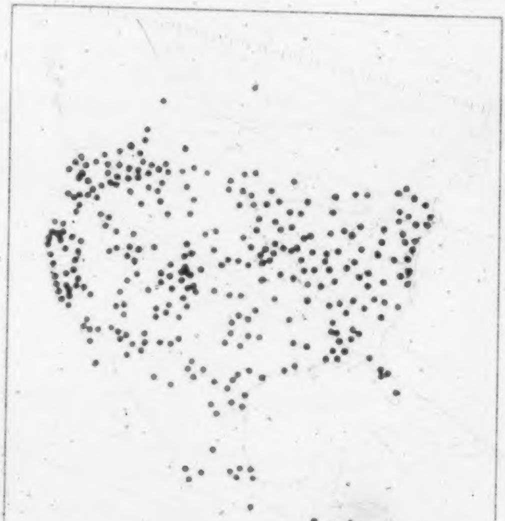
153

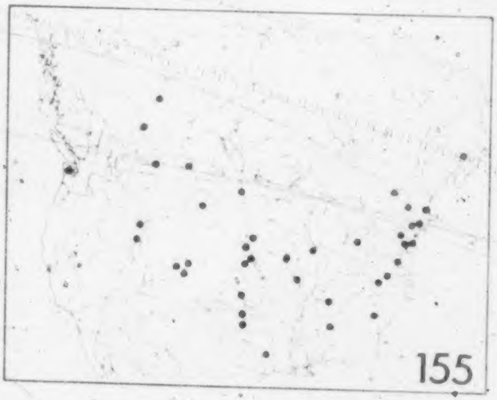
149


150

151


154


152


155

Nearctic distribution of:

Fig. 156. Hippodamia parenthesis (Say)

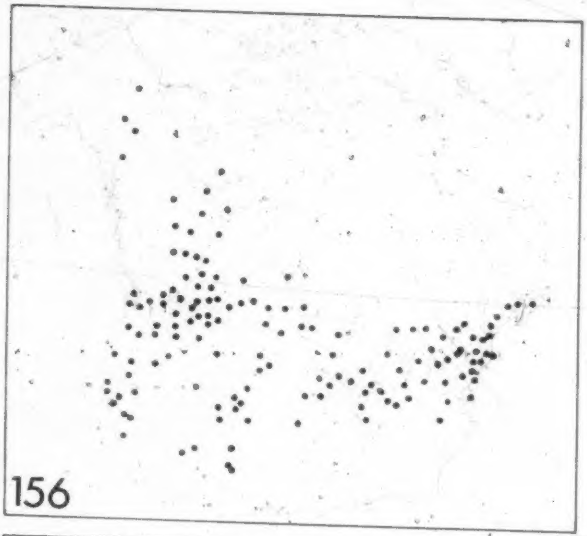
Fig. 157. Hippodamia quinquesignata (Kirby)

Fig. 158. Hippodamia sinuata Mulsant

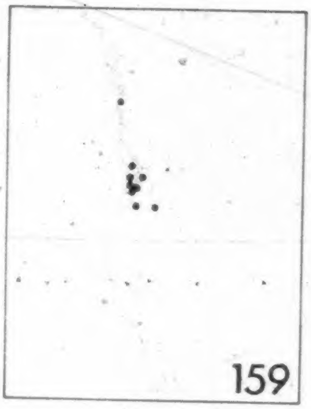
Fig. 159. Hippodamia washingtoni Timberlake

Fig. 160. Macronaemia episcopalis (Kirby)

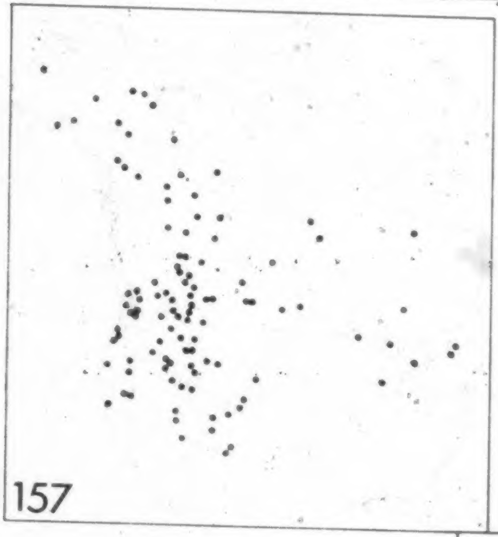
Fig. 161. Hippodamia tredecimpunctata (Linnaeus)



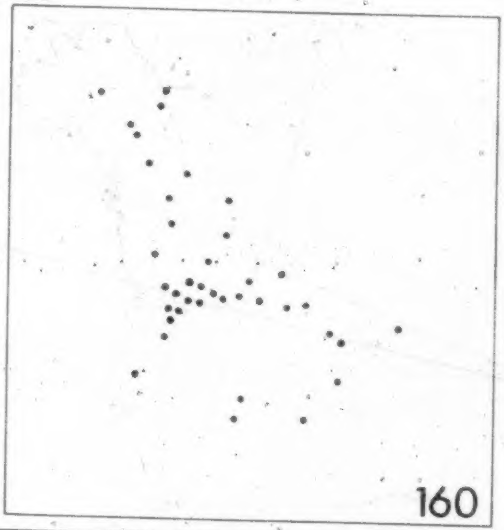
156



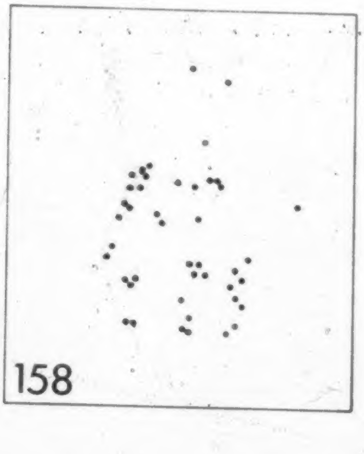
159



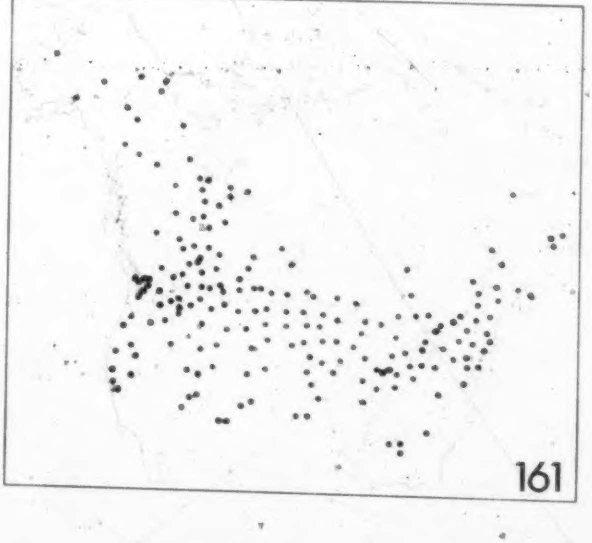
157



160



158



161

Nearctic distribution of:

Fig. 162. *Mulsantina picta* (Randall)

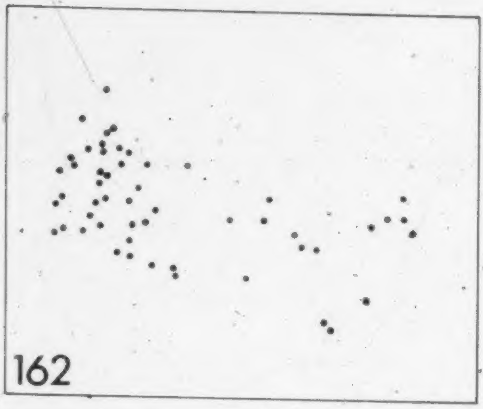
Fig. 163. *Mulsantina hudsonica* (Casey)

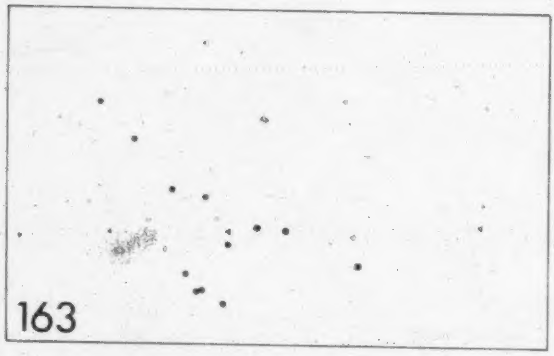
Fig. 164. *Anisosticta bitriangularis* (Say)

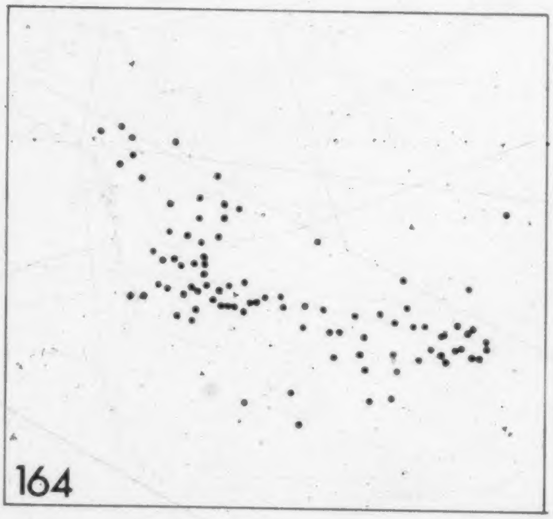
Fig. 165. *Anisosticta borealis* Timberlake

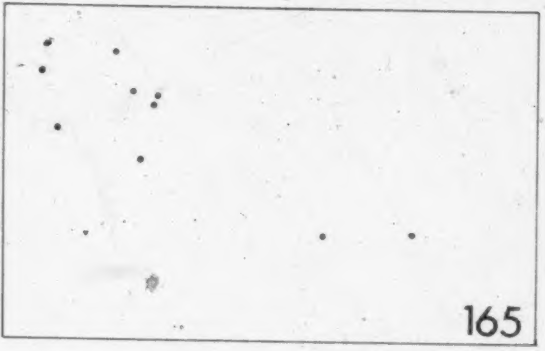
Fig. 166. *Psyllobora vigintimaculata* (Say)

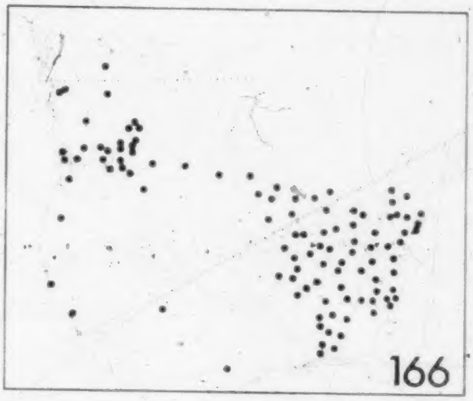
Fig. 167. *Psyllobora borealis* Casey


162


163


164


165


166

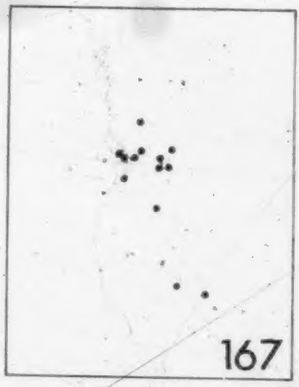
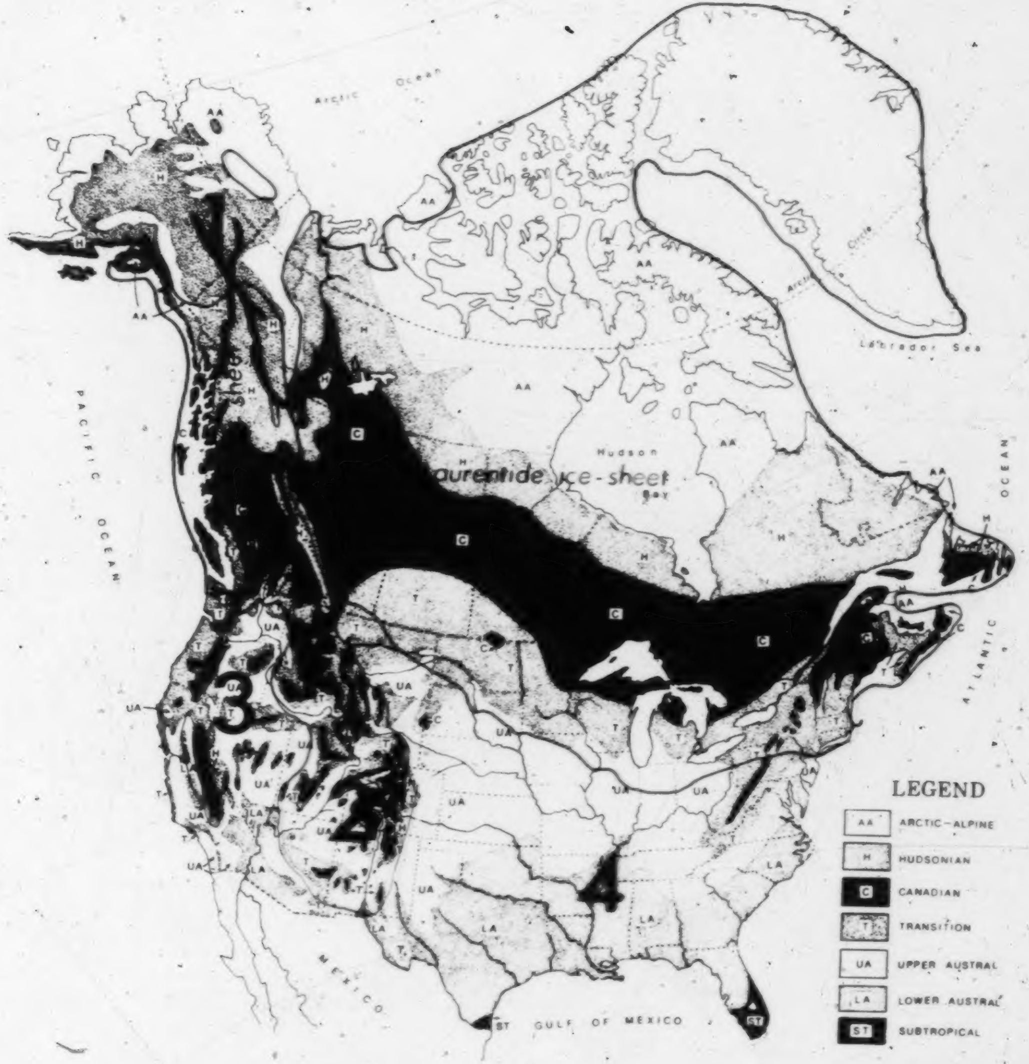

167

Fig. 168. Maximum extent of Wisconsin glaciation (ca. 17-18,000 years BP), and source areas of post-glacial dispersal. Speculative ice-margin positions of Wisconsin and recent ice-sheets adopted and modified from the Geological Survey of Canada (1969) map No. 1257A.

Fig. 169. Life zones of North America. Delineation of life zones adopted from Howe (1975).


Arctic Ocean
PACIFIC OCEAN
ATLANTIC OCEAN
Hudson Bay
Labrador Sea
Arctic Circle
Laurentide ice-sheet
sheet
MEXICO
GULF OF MEXICO
3
4
4
LEGEND
AA ARCTIC-ALPINE
H HUDSONIAN
C CANADIAN
T TRANSITION
UA UPPER AUSTRAL
LA LOWER AUSTRAL
ST SUBTROPICAL

169

168

Fig. 170. *Hyperaspidius hercules*, new species

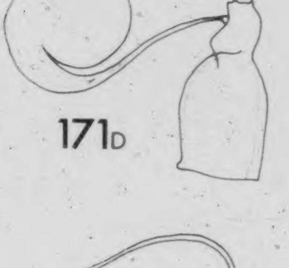
170A.-spermatheca; 170B.-median lobe (lateral aspect); 170C.- tegmen (lateral aspect); 170D.- basal lobe (dorsal aspect).

Fig. 171. *Hyperaspis jasperensis*, new species

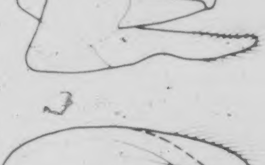
171A.- tegmen (lateral aspect); 171B.-median lobe (lateral aspect); 171C.- basal lobe (dorsal aspect); 171D.-spermatheca

Fig. 172. *Anatis borealis*, new species

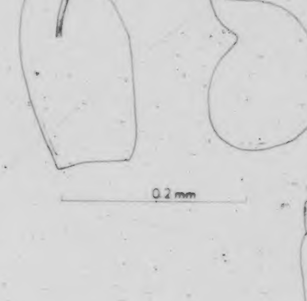
172A.- median lobe (lateral aspect); 172B.-tegmen (lateral aspect); 172C.- basal lobe (dorsal aspect); 172D.- spermatheca



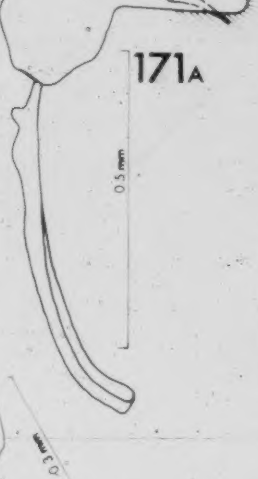
171D



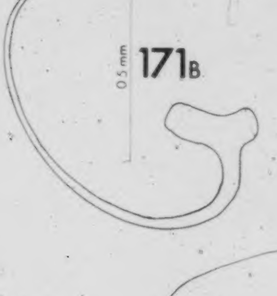
171C



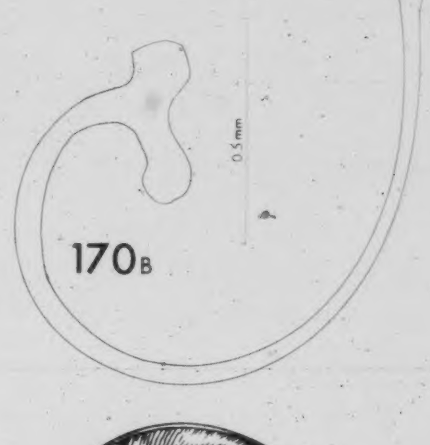
170A



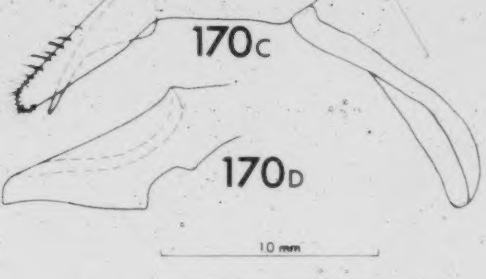
171A



171B

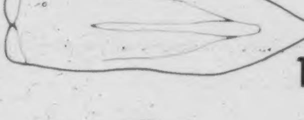


170B

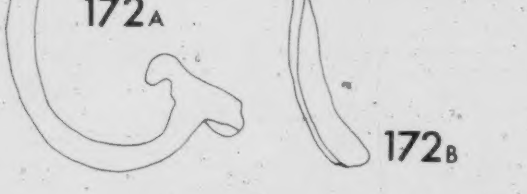


170C

170D

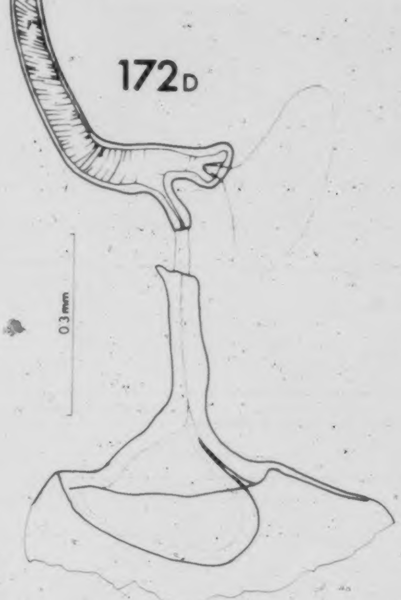


172C



172A

172B



172D

Fig. 173. Hind leg, *Hyperaspis annexa* LeConte

Fig. 174. Hind leg, *Hyperaspis lateralis* Mulsant

Fig. 175. Antenna, *Hyperaspidius insignis* Casey

Fig. 176. Front leg, *Brachiacantha dentipes*

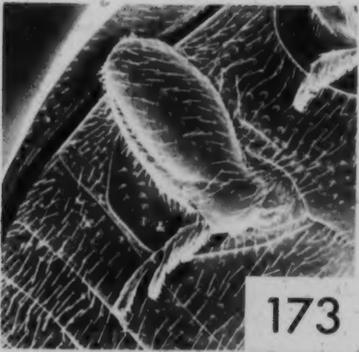
Fig. 177. Antenna, *Hyperaspis lateralis* Mulsant

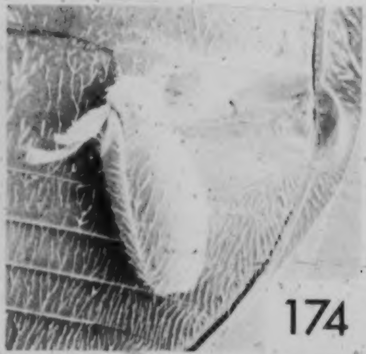
Fig. 178. Antenna, *Hyperaspis annexa* LeConte

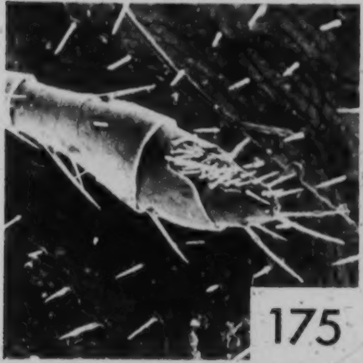
Fig. 179. Metacoxal arc, right side; *Hyperaspidius insignis* Casey

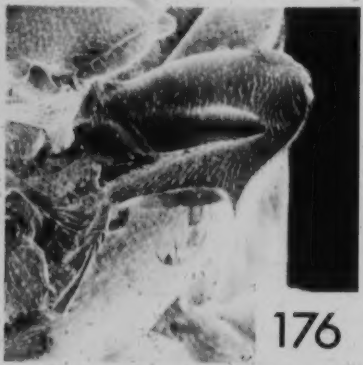
Fig. 180. Metacoxal arc, left side; *Hyperaspidius insignis* Casey

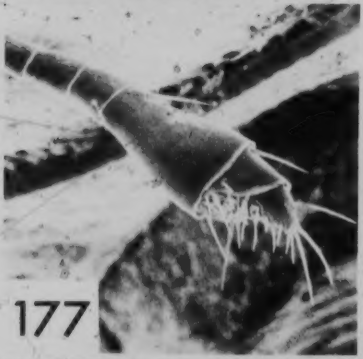
Scanning Electron Micrographs

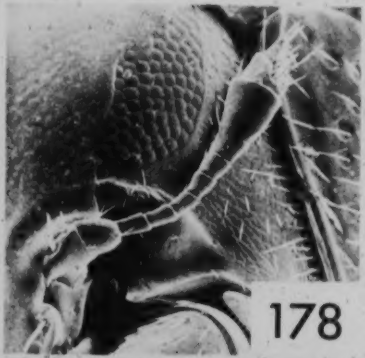

173

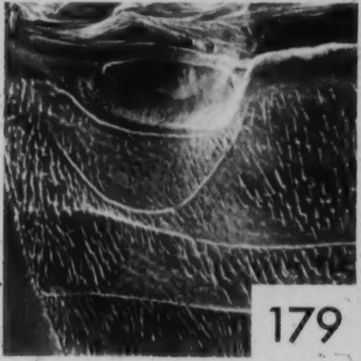

174


175


176


177


178


179

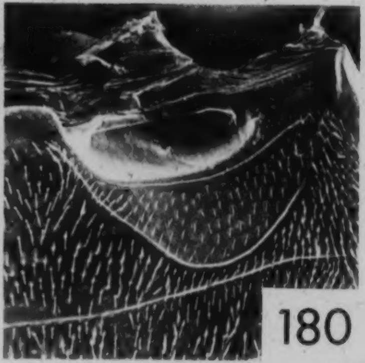

180

Fig. 181. Tarsal claws, *Hyperaspis lateralis* Mulsant

Fig. 182. Tarsal claws, *Hyperaspidius insignis* Casey

Fig. 183. Tarsal claws, *Brachiacantha dentipes* (Fabricius)

Fig. 184. Tarsal claws, *Brachiacantha dentipes* (Fabricius)

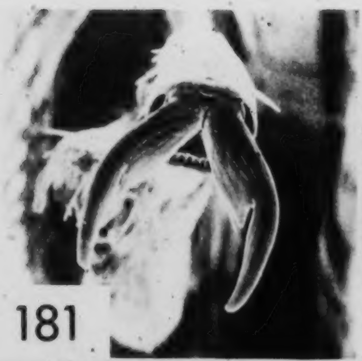
Fig. 185. Tarsal claws, *Hyperaspis lateralis* Mulsant

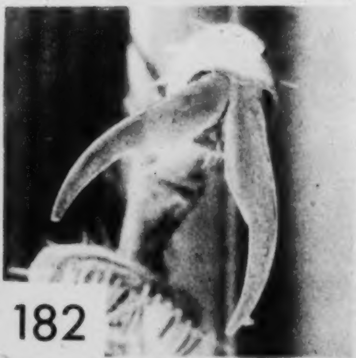
Fig. 186. Tarsal claws, *Hyperaspis annexa* LeConte

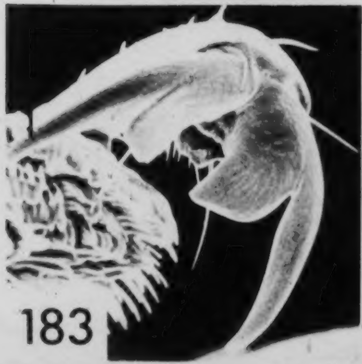
Fig. 187. Tarsal claws, *Hyperaspis annexa* LeConte

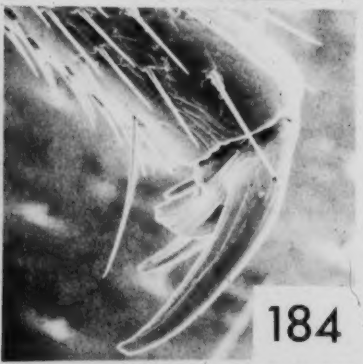
Fig. 188. Tarsal claws, *Hyperaspis lateralis* Mulsant

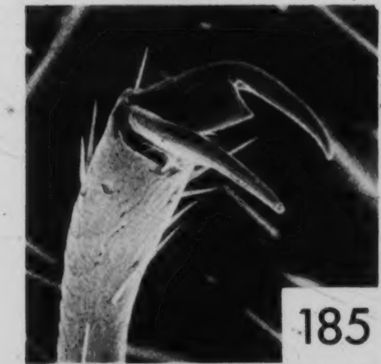
Scanning Electron Micrographs

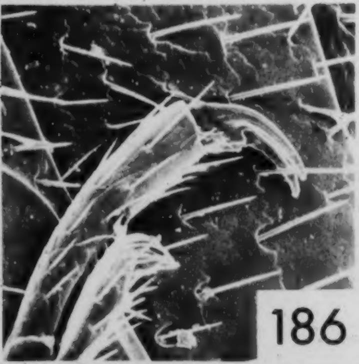

181

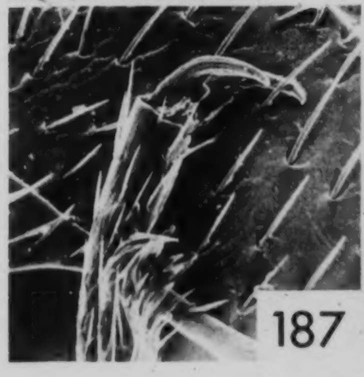

182


183


184


185


186


187

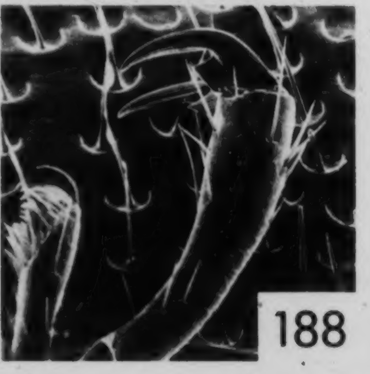

188

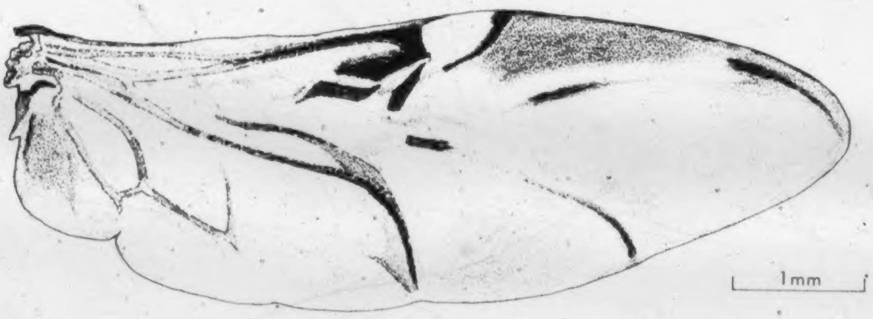
Fig. 189. Hind wing, Hippodamia oregonensis Crotch

Fig. 190. Tarsus, Hyperaspis jasperensis, new species

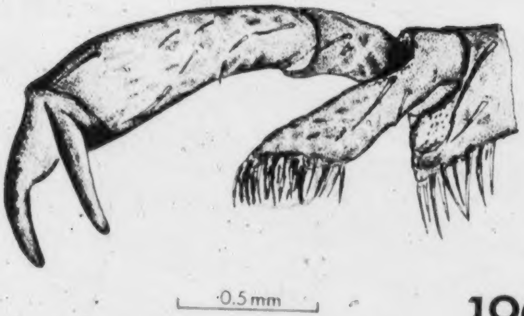
Fig. 191. Labium, Hyperaspis jasperensis, new species

Fig. 192. Antenna, Hippodamia oregonensis Crotch

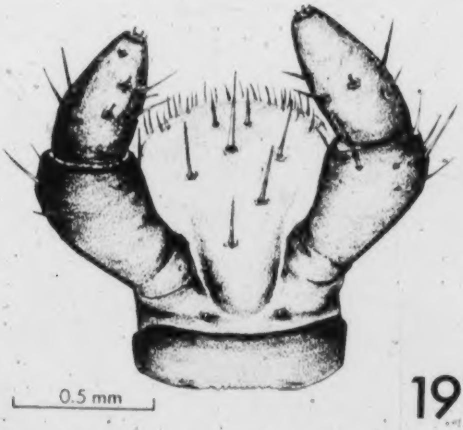
(Figs. 190, 191 traced from SEM micrographs)



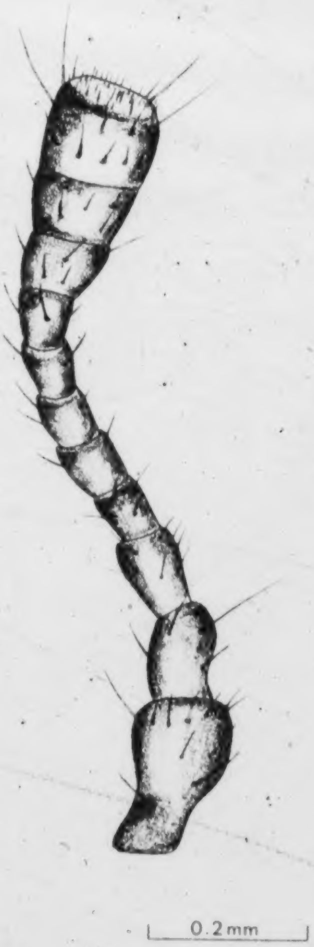
189



190



191



192

Fig. 193. Dispersal routes between Alberta and British Columbia:

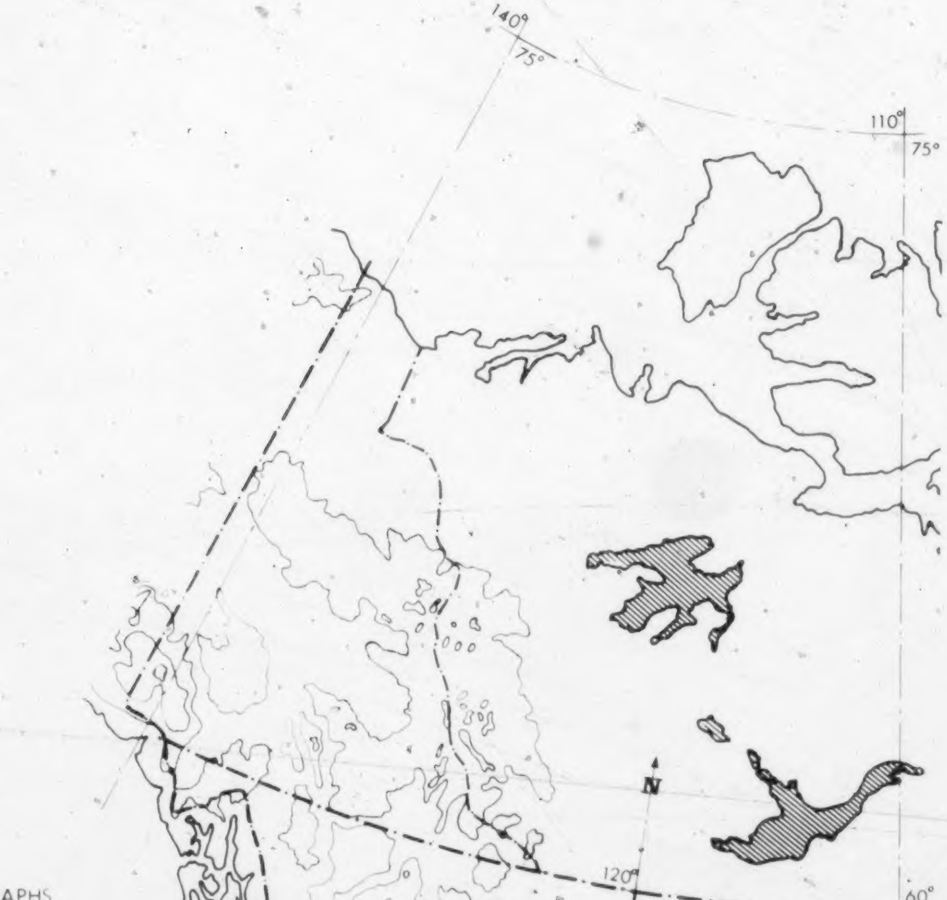
A - Upper Peace River pass

B - Yellowhead Pass

C - Banff National Park pass

D - Crowsnest Pass

E - Waterton National Park pass


140°
75°
110°
75°
N
120°
60°
49°
HYPSOGRAPHS
1000M INTERVALS
A
B
C
D
E
KILOMETERS
0
200
400
600
0
200
400
MILES

193

5.0 LITERATURE CITED

Anonymous. 1906. A list of Coccinellidae of British Columbia. Bulletin of British Columbia Entomological Society, 1:3-4.

Arnett, R. H. Jr., 1967. Present and future systematics of the Coleoptera in North America. Annals of the Entomological Society of America, 60(1):162-170.

Arnett, R. H. Jr., 1968. The beetles of the United States. (A manual for identification). The American Entomological Institute, Ann Arbor; Michigan. xii + 1112 pp.

Balduf, W. V. 1935. The bionomics of entomophagous Coleoptera. Chapter 13, Coccinellidae. J. S. Swift Co., Inc. Chicago, New York. 220 pp.

Bělíček, J. 1976. Notes on classification, natural history, individual and polymorphic variation in adults of North American *Calvia* (*Anisocalvia*) *quatuordecimguttata* (Linnaeus). (Insecta: Coleoptera: Coccinellidae). In preparation.

Bielawski, R. 1958. A revision of the genus *Anisosticta* Duponch., with a description of a new species from Siberia (Coleoptera: Coccinellidae). Annales Musei Zoologici, Warszawa; 17: 91-112.

Billberg, G. J. 1820. Enumeration Insectorum in Museo Gust. Joh. Billberg. Gadelianis, Stockholm. 138 pp.

Blackwelder, R. E. 1945. Checklist of the coleopterous insects of Mexico, Central America, the West Indies, and South America. United States National Museum Bulletin, 185:343-550.

Blackwelder, R. E. 1967. Taxonomy. A text and reference book. John Wiley and Sons, Inc., New York. xii + 698 pp.

Bland, J. H. B. 1864. Descriptions of several new species of North American Coleoptera. Proceedings of the Entomological Society of Philadelphia, 3: 65-72.

Bouillon, J. B. 1858. Un numero de la faune entomologique Belge. Coccinelles des auteurs. Annales de la Societe Entomologique Belge, 2:1-28.

Bousfield, E. L. 1958. Fresh-water amphipod crustaceans of glaciated North America. Canadian Field Naturalist, 72: 55-113.

Böving, A. C. 1917. A generic synopsis of coccinellid larvae in the United States National Museum, with a description of the larva of Hyperaspis binotata Say. Proceedings of the United States National Museum, 51:621-650.

Bowditch, F. C. 1902. Notes on Casey's revision of the American Coccinellidae. Entomological News, 13: 205-207.

Brethes, J. 1925. Coccinellides du British Museum (avec une nouvelle famille de coleopteres). Anales del Museo Nacional de Historia Natural, Buenos Aires; Entomologia Publication No. 106, vol. xxxiii, pp. 195-214.

Britton, W. E. 1915. Miscellaneous insect notes. In

Fourteenth report of the State Entomologist of Connecticut for the year 1914, beig the part III of the annual report of 1914. New Haven, Connecticut. iv + 198 pages, plates IX-XXIV, + pages i-viii (index).

Brodie, W. 1888. List of Coleoptera collected by Mr. Bruce Bailey, in Kicking Horse Pass, Rocky Mountains, C. P. R. 1884. Proceedings of the Canadian Institute, Toronto, 3(5):213-215.

Brown, W. J. 1950. The extralimital distribution of some species of Coleoptera. Canadian Entomologist, 82:200.

Brown, W. J. 1962. A revision of the forms of *Coccinella* L., occuring in America north of Mexico (Coleoptera: Coccinellidae). Canadian Entomologist, 94(8):784-808.

Brown, W. J. 1967. The mexican forms of *Coccinella* (Coleoptera: Coccinellidae). Canadian Entomologist, 99(1): 107-108.

Brown, W. J. and R. de Ruette. 1962. An annotated list of Hippodamiini of Northern America, with a key to the genera (Coleoptera: Coccinellidae). Canadian Entomologist, 94(6):643-652.

Calder, J. A. and R. L. Taylor. 1968. Flora of the Queen Charlotte Islands, Part 1; Systematics of the vascular plants. Research Branch, Canada Department of Agriculture, Monograph No. 4, Part 1. Queen's Printer, Ottawa. xiii + 659 pp.

Carr, F. S. 1920. An annotated list of the Coleoptera of northern Alberta. Alberta Natural History Society, Red

Deer. 8 pp.

Casey, T. L. 1899. A revision of the American Coccinellidae. Journal of the New York Entomological Society, 7:71-169.

Casey, T. L. 1908. Notes on the Coccinellidae. Canadian Entomologist, 40:393-421.

Casey, T. L. 1924. Additions to the known Coleoptera of North America, p. 155-176. In Casey, T. L. 1924. Memoirs on the Coleoptera, vol. XI. New Era Publishing Company, Lancaster; Pennsylvania. 347 pp.

Chapin, E. A. 1946. Review of the New World species of *Hippodamia* Dejean (Coleoptera: Coccinellidae). Smithsonian Miscellaneous Collections, 106(11):1-39.

Chapin, E. A. 1965a. The genera of the Chilocorini (Coleoptera: Coccinellidae). Bullletin of the Museum of Comparative Zoology, Harvard University, 133:227-271.

Chapin, E. A. 1965b. In Insects of Micronesia. Coleoptera, Coccinellidae. Bernice P. Bishop Museum, Honolulu, Hawaii, 16(5): 189-254.

Chapin, J. B. 1973. New species of lady beetles in the genera *Scymnus* and *Mulsantina* (Coleoptera: Coccinellidae). Annals of the Entomological Society of America, 66(5):1071-1073.

Chapman, J. A. 1954. Studies on summit frequenting insects in western Montana. Ecology, 35:41-49.

Chapuis, M. F. 1876. In Lacordaire's Histoire naturel des Insectes. Genera des Coleopteres ou expose methodique et critique de tous les genres proposes jusqu'ici dans cet ordre d'insectes. Vol. 12. Famille des Erotyliens, des Endomychides et des Coccinellides. Paris. 424 pp.

Chevrolat, L. A. 1835. Coleopteres de Mexique. Fascicle 5. Strasbourg. 50 pp.

Chevrolat, L. A. 1842. In d'Orbigny, Dictionnaire universel d'histoire naturelle; vol. 2. Paris. 796 pp.

Clark, M. E. 1948-1956. An annotated list of the Coleoptera taken at or near Terrace, British Columbia. Proceedings of the Entomological Society of British Columbia, 44:24-27; 45:21-24; 52:39-43.

Clausen, C. P. 1940. Entomophagous insects. McGraw-Hill Co., London, New York. 688 pp.

Cockerell, T. D. 1903. The coccinellid genus Smilia, Weise. The Canadian Entomologist, 35: 38.

Collyer, E. 1953. Biology of some predatory insects and mites associated with the fruit tree red spider mite (Metatetranychus ulmi (Koch)) in Southern England. II. Some important predators of the mite. Journal of the Horticultural Science, 28: 85-97.

Coope, G. R. 1970. Interpretations of Quaternary insect fossils. Annual review of Entomology, 15: 97-120.

Coope, G. R. and J. A. Brophy. 1972. Late glacial changes indicated by a coleopteran succession from North Wales. Boreas, 1(2): 97-142.

Coope, G. R. 1973. Tibetian species of dung beetle from late Pleistocene deposits in England. Nature, 245 (No.

5424): 335-336.

Coope, G. R. and R. B. Angus. 1975. An ecological study of a temperate interlude in the middle of the last glaciation, based on fossil Coleoptera from Isleworth, Middlesex. Journal of Animal Ecology, 44: 365-391.

Costa, A. 1849. Fauna dell regne di Napoli. Coleotteri. Fascicle 65. Napoli. 112 pp.

Crotch, G. R. 1871. List of Coccinellidae. Cambridge. 8 pp.

Crotch, G. R. 1873. Revision of the Coccinellidae of the United States. Transactions of the American Entomological Society, 4:363-382.

Crotch, G. R. 1874a. Descriptions of new species of Coleoptera from the Pacific Coast of the United States. Transactions of the American Entomological Society, 5:73-80.

Crotch, G. R. 1874b. A revision of the Coleopterous family Coccinellidae. E. W. Janson, London. xv + 311 pp.

Cutright, C. R. 1924. Bionomics of *Hippodamia tredecimpunctata* L. Annals of the Entomological Society of America, 17: 188-192.

Darlington, P. J. 1943. Carabidae of mountains and islands: data on the evolution of isolated faunas, and on atrophy of wings. Ecological Monographs, 13:38-61.

Darlington, P. J. 1957. Zoogeography: the geographical distribution of animals. John Wiley and Sons, Inc., New York. 675 pp.

Davidson, W. M. 1921. Observation on *Psyllobora taedata*

LeConte, a coccinellid attacking mildews. Entomological News, 32: 83-89.

Dejean, P. F. M. A. 1836. Catalogue des coleopteres de la collection de M. le comte Dejean. Troisieme edition, revue, corrigee et augmentee, livr. 1-4; Paris. 468 pp.

Dice, L. R. 1943. The biotic provinces of North America. University of Michigan Press, Ann Arbor. viii + 78 pp.

Dice, L. R. 1952. (1955 edition). Natural communities. University of Michigan Press, Ann Arbor. x + 547 pp.

Dobzhansky, T. 1925a. Zur Kenntnis der Gattung *Coccinella* auct. Zoologische Anzeiger, 67:241-249.

Dobzhansky, T. 1925b. Die palaearktischen Arten der Gattung *Coccinula* Dobzh. Zoologische Anzeiger, 67:277-284.

Dobzhansky, T. 1926. Die palaearktischen Arten der Gattung *Coccinella* L. Revue de russe Entomologie, 20:16-32.

Dobzhansky, T. 1927. Ueber die Morphologie und systematische Stellung einiger Gattungen der Coccinellidae (tribus Hippodamiina). Zoologische Anzeiger, 69:200-208.

Dobzhansky, T. 1931. The North American beetles of the genus *Coccinella* . Proceedings of the United States National Museum, 80(4):1-32.

Dobzhansky, T. 1935. A list of Coccinellidae of British Columbia. Journal of the New York Entomological Society, 43:331-336.

Dobzhansky, T. 1941. Beetles of the genus *Hyperaspis* inhabiting the United States. Smithsonian Miscellaneous

Collections, 101(6):1-94.

Edwards, J. G. 1957. Entomology above timberline. II. The attraction of ladybird beetles to the mountain tops. Coleopterists' Bulletin, 11:41-46.

El-Hariri, G. 1966. Studies of the physiology of hibernating Coccinellidae (Coleoptera): changes in the metabolic reserves and gonads. Proceedings of the Royal Entomological Society of London, (A) 41: 137-144.

Emden, F. I. 1949. Larvae of British beetles. VII. Coccinellidae. Entomologist's Monthly Magazine, 85: 265-383.

Emmons, E. 1854. The natural history of New York, Albany. Vol. 5, Insects of New York. 256 pp.

Ewing, H. E. 1913. Notes on Oregon Coccinellidae. Journal of Economic Entomology, 6: 404-407.

Fabricius, J. C. 1775. Systema entomologiae. Lipsiae. 832 pp.

Fabricius, J. C. 1777. Genera insectorum. Chilonii. 310 pp.

Fabricius, J. C. 1781. Species insectorum, vol. 1. Kilonii. 522 pp.

Fabricius, J. C. 1798. Supplementum entomologiae systematicae. Proft et Storch, Hafniae. 572 pp.

Fairbridge, R. W. 1960. The changing level of the sea. Scientific American, May 1960; pp. 70-79.

Falderman, F. 1835. Coleopterorum ab ill. Bungio in China boreali, Mongolia et montibus Altaicis collectorum, nec non ab ill. Turczaninoffio et Stschukino e provincia

Irkutzk missorum illustrationes. Memoires de l'Academie Imperiale des Sciences de St.-Petersbourg, 2: 337-464.

Fall, H. C. 1926. A list of the Coleoptera taken in Alaska and adjacent parts of the Yukon Territory in the summer of 1924. Pan-Pacific Entomologist, 2(3): 127-154, 2(4): 191-208.

Felt, E. P. 1906. Insects affecting park and woodland trees. New York State Museum, Memoir 8: 333- 877.

Fields, G. J. and R. D. McMullen, 1972. Aggregation sites and behavior of two species of *Hippodamia* (Coleoptera: Coccinellidae) in south-central British Columbia. Journal of the Entomological Society of British Columbia, 69: 25-27.

Flint, R. F. 1963. (3rd edition). Glacial and Pleistocene geology. John Wiley & Sons, Inc., New York. xiii + 553 pp.

Freeman, T. N. 1958. A historical account of insect collecting in Northern Canada. Proceedings of the 10th International Congress of Entomology, 1:613-617.

Freitag, R. 1965. A revision of the North American species of the *Cicindela maritima* group with a study of hybridization between *Cicindela duodecimguttata* and *oregona*. Quaestiones Entomologicae, 1:87-170.

Fürsch, H. 1972. Die *Hyperaspis* Arten Afrikas mit Ausnahme des Mittelmeergebietes (Coleoptera: Coccinellidae). Annales Musee Royal de l'Afrique Centrale, Tervuren; Serie IN8°, Sciences Zooologiques, No. 201: 1-76.

Gage, J. H. 1920. The larvae of the Coccinellidae. Illinois Biological Monographs, 6:232-294.

Gebler, F. 1832. Notice sur les coleopteres qui se trouvent dans le district des mines de Nertschinsk, dans la Siberie orientale. Memoires de la Societe Imperiale des Naturalistes de Moscou, 2: 23-78.

Geological Survey of Canada. 1969. Map 1257A. Retreat of Wisconsin and recent ice in North America. Speculative ice-marginal positions during recession of last ice-sheet complex.

Gordon, R. D. 1970a. New genera and species of Coccinellidae from western United States. (Coleoptera). Proceedings of the Entomological Society of Washington, 72(1): 42-50.

Gordon, R. D. 1970b. The genus Cephaloscymnus Crotch in North America. (Coleoptera: Coccinellidae). Proceedings of the Entomological Society of Washington, 72(1): 66-70.

Gordon, R. D. 1970c. Tribal and generic reassignement in the Coccinellidae. (Coleoptera). Proceedings of the Entomological Society of Washington, 72(2): 217.

Gordon, R. D. 1970d. A review of the genus Delphastus Casey. (Coleoptera: Coccinellidae). Proceedings of the Entomological Society of Washington, 72(3): 356-369.

Gordon, R. D. 1970e. A review of the genus Nipus Casey (Coleoptera: Coccinellidae). Coleopterist's Bulletin, 24(3): 71-75.

Gordon, R. D. 1972. The tribe Noviini of the New World. (Coleoptera: Coccinellidae). Journal of the Washington Academy of Science, 62(1): 23-31.

Gordon, R. D. 1974a. Notes on the North American species of Chilocorini (Coleoptera: Coccinellidae) with descriptions of two new species of Exochomus from Mexico. Coleopterists' Bulletin, 28(1):1-6.

Gordon, R. D. 1974b. Notes on Neoharmonia Crotch (Coleoptera: Coccinellidae) in the United States and Mexico. Proceedings of the Entomological Society of Washington, 76(2):165-171.

Gordon, R. D. 1976. In press. The Scymnini (Coleoptera: Coccinellidae) of the United States and Canada: Key to genera and revisions of Scymnus, Nephus and Diomus. Bulletin of the Buffalo Academy of Sciences, New York; January 1976.

Graham, A. 1965. Origin and evolution of the biota of southeastern North America: evidence from the fossil plant record. Evolution, 18:571-585.

Griffiths, G. C. D. 1972. Studies on the phylogenetic classification of Diptera Cyclorrhapha, with special reference to the structure of the male postabdomen. Series Entomologica, vol. 8. Dr. W. Junk N. V. Publishers, The Hague, pp. 1-340.

Guérin-Méneville, F. E. 1844. Iconographie du Regne animal de Cuvier.. vol. 7, insectes, 1829-1838. Paris. 576 pp.

Günther, V. 1959. Vertretér des Tribus Hyperaspini (Col., Coccinellidae) aus der Tschechoslowakei. Acta Societatis Entomologicae Čechosloveniae, 56(3): 255-264.

Hagen, K. S. 1962. Biology and ecology of predaceous Coccinellidae. Annual Review of Entomology, 7:289-326.

Hagen, K. S. 1966. Coccinellid aggregations. pp. 131-133. *In* Ecology of aphidophagous insects, Proceedings of a symposium held in Liblice near Prague, September 27th - October 1st, 1965. Academia, Prague. 360 pp.

Hagmeier, E. M. 1966. A numerical analysis of the distribution of North American mammals. II. Re-evaluation of the provinces. Systematic Zoology, 15(4): 279-299.

Hatch, M. H. 1962. The beetles of the Pacific Northwest. Part III. Pselaphidae and Diversicornia I. University of Washington Publications in Biology, no. 16. Seattle. xii + 503 pp.

Hawkes, O. A. M. 1926. On the massing of the ladybird *Hippodamia convergens* in the Yosemite Valley. Proceedings of the Zoological Society of London, 1926; pp. 693-705.

Hennig, W. 1950. Grundzuge einer Theorie der phylogenetischen Systematik. Deutscher Zentralverlag, Berlin. 370 pp.

Hennig, W. 1966. Phylogenetic systematics. English translation. University of Illinois Press, Urbana. 263 pp.

Herbst, J. F. W. 1783. Kritisches Verzeichniss meiner Insecten-Sammlung. Archiv der Insectengeschichte, Heft 4; pp. 1-68.

Heusser, C. J. 1960. Late-Pleistocene environments of the North Pacific North America. The American Geographical Society, Special publication No. 35. 308 pp.

Hibbard, C. W., D. E. Ray, D. E. Savage, D. W. Taylor, J. E. Guilday. 1965. Quaternary mammals of North America. pp. 509-525. *In* Wright, H. E. and D. G. Frey (editors). The Quaternary of the United States. *Loco citato*.

Hodek, I. (ed.), 1966. Ecology of aphidophagous insects. Proceedings of a symposium held in Liblice near Prague, September 27- October 1, 1965. Academia, Prague. 360 pp.

Hodek, I. 1967. Bionomics and ecology of predaceous Coccinellidae. Annual Review of Entomology, 12:79-104.

Hodek, I. *et al*. 1973. Biology of Coccinellidae. Academia, Czechoslovak Academy of Sciences; Prague. 260 pp.

Hope, F. W. 1840. Coleopterist's manual, part the third, containing various families, genera, and species, of beetles recorded by Linnaeus and Fabricius. Also descriptions of newly discovered and unpublished insects. London. 191 pp.

Hopkins, D. M. 1967. The Bering Land Bridge. Stanford University Press, Stanford, California. xiii + 495 pp.

Hopkins, D. M., Matthews, J. V. Jr., Wolfe, J. A. and Silberman, M. L. 1971. A Pliocene flora and insect fauna from the Bering Strait region. Palaeography, Palaeoclimatology, Palaeoecology, 9: 211-231.

Horn, G. H. 1895. Studies in Coccinellidae. Transactions of the American Entomological Society, 22:81-114.

Howe, W. H. 1975. The Butterflies of North America. Doubleday and Company, Inc., Garden City, New York. xiii + 633 pp.

Hubbs, C. L. 1943. Criteria for subspecies, species and genera, as determined by researches on fishes. Annals of the New York Academy of Sciences, 44(2):109-121.

Hull, D. L. 1970. Contemporary systematic philosophies. Annual review of ecology and systematics, 1: 19-54.

Iablokoff-Khnzorian, S. M. 1971. Synopsis des Hyperaspis Palearctiques (Col., Coccinellidae). Annales Societe entomologique de France (N.S.), 7(1):163-200.

Illiger, J. C. W. 1798. Verzeichniss der Kafer Preussens, ausgearbeitet von Illiger, mit einer Vorrede von Helwig und dem angehangten Versuch einer naturlichen Ordnung und Gattungsfolge der Insecten. Halle. 510 pp.

Jeannel, R. 1955. L' edeage. Initiation aux recherches sur la systematique des Coleopteres. Publication Museum Natural Histoire, No. 16. Paris.

Johnson, R. H. 1910. Determinate evolution in the color pattern of the lady-beetles. Carnegie Institution, Washington. Publication no. 122. 56 pp.

Kaiser, G. W., L. P. Lefkovitch, and H. Howden. 1972. Faunal provinces in Canada as exemplified by mammals and birds: a mathematical consideration. Canadian Journal of Zoology, 50(8): 1087-1104.

Kamiya, H. 1964. Comparative morphology of larvae of the Japanese Coccinellidae, with special reference to the tribal phylogeny of the family (Coleoptera). Memoirs of the Faculty of Liberal Arts, Fukui University, Series II, Natural Sciences, 14: 83-100.

Kapur, A. P. 1948. On the Old World species of the genus Stethorus Weise (Coleoptera: Coccinellidae). Bulletin of Entomological Research, 39: 297-320.

Kapur, A. P. 1968. The Coccinellidae of the third Mount Everest expedition, 1924 (Coleoptera). Bulletin of the British Museum of Natural History (Entomology), 14(1): 1-48.

Keen, J. H. 1895. List of Coleoptera collected at Masset, Queen Charlotte Islands. Canadian Entomologist, 27(7): 165-172, 217-220.

Kellogg, V. L. and R. G. Bell, 1904. Studies of variation in insects. Proceedings of the Washington Academy of Sciences, 6: 203-332.

Kendeigh, S. C. 1932. A study of Merriam's temperature laws. Wilson Bulletin, 44: 129-143.

Kirby, W. 1837. In Fauna Boreali-Americana by Sir J. Richardson et al., 1829-1837. The insects. Part 4. London. 325 pp.

Klausnitzer, B. 1970. Zur Kenntnis der Larven der mitteleuropaeischen Coccinellidae (Col.).

Entomologische Abhandlungen der Staatliche Museum für Tierkunde, Dresden; 38:55-110.

Korschefsky, R. 1931. Coleopterorum catalogus. Part 118. Coccinellidae. Antiquariaat Junk, Berlin. 224 pp.

Korschefsky, R. 1932. Coleopterorum catalogus. Part 120. Coccinellidae. Antiquariaat Junk, Berlin. 435 pp.

Kugelann, J. G. 1792. Verzeichniss der in einigen Gegenden Preussens bis jetzt entdeckten Käfer-arten nebst kurz Nachrichten von denselben. Neues Magazin fur Liebhaber der Entomologie, 2:252-256.

Larson, D. J. 1975. The predaceous water beetles (Coleoptera, Dytiscidae) of Alberta: systematics, natural history, and distribution. Quaestiones Entomologicae, 11(3): 245-498.

Latreille, P. A. 1818. In Cuvier, Le regne animal, vol. 3. Paris. 29+ 653 pp.

Leach, W. E. 1815. The zoological miscellany, vol. 2. London. 154 pp.

LeConte, J. L. 1850. General remarks upon the Coleoptera of Lake Superior. In Agassiz, Lake Superior: its physical character, vegetation and animals,.. p. 201 - 242. Boston.

LeConte, J. L. 1852. Remarks upon the Coccinellidae of the United States. Proceedings of the Academy of Natural Sciences of Philadelphia, 6:129-145.

LeConte, J. L. 1857. Report upon insects collected on the survey. Reports of explorations and surveys for a railroad route from the Mississippi River to the Pacific Ocean. Washington. 72 pp.

LeConte, J. L. 1858. Descriptions of new species of Coleoptera, chiefly collected by the United States and Mexican Boundary Commission, under Maj. W. H. Emory, U. S. A. Proceedings of the Academy of Natural Sciences of Philadelphia, 10:59-89.

LeConte, J. L. 1878. Additional descriptions of new species. *In* Schwarz, The Coleoptera of Florida. Proceedings of the American Philosophical Society, 17:353-372.

LeConte, J. L. 1880. Short studies on North American Coleoptera. Transactions of the American Entomological Society, 8:163-218.

LeConte, J. L. 1883. The complete writings of Thomas Say on the entomology of North America. S. E. Casino & Company, Boston. Vol. I. xxiv + 412 pp.; Vol. II. iv + 814 pp.

Leng, C. W. 1903a. Notes on Coccinellidae. I. Journal of the New York Entomological Society, 11:35-45. 1903b. II. pp. 193-213.

Leng. C. W. 1908. Notes on Coccinellidae. III. Journal of the New York Entomological Society, 16:33-48.

Leng, C. W. 1911. The species of *Brachyacantha* of North and South America. Bulletin of the American Museum of Natural History, 30(12):279-333.

Leng, C. W. 1919. *In* Report of the Canadian Arctic

Expedition 1913-18. Volume III: Insects. Part B: Coleoptera. Coccinellidae, Elateridae, Chrysomelidae, and Rhynchopora (excluding Ipidae). J. de Labroquerie Tache, Ottawa. Pp. 17-18.

Leng, C. W. 1920. Catalogue of the Coleoptera of America, north of Mexico. John D. Sherman, Jr., Mount Vernon; New York. 470 pp.

Leng, C. W. and Mutchler, A. J. 1933. Second and third supplements 1925 to 1932 (inclusive) to catalogue of Coleoptera of America, north of Mexico. John D. Sherman, Jr., Mount Vernon; New York. 112 pp.

Lindroth, C. H. 1965. Skaftafell, Iceland, a living glacial refugium. Oikos, Supplementum 6: 1-142.

Lindroth, C. H. 1969. The biological importance of Pleistocene refugia. (Chapter 1), pp. 7-17. Concluding remarks concerning the importance of the Kodiak Island refugium for the survival of the biota. (Chapter 12) pp. 236-288. In Karlstrom, T. N. V. and G. E. Ball (editors). The Kodiak Island refugium. Reyerson Press, Toronto. 260 pp.

Linnaeus, C. 1758. Systema naturae, 10th edition. Stockholm. 826 pp.

Linnaeus, C. 1767. Systema naturae, 12th edition. Stockholm. 830 pp.

Lusis, J. J. 1932. An analysis of the dominance phenomenon in the inheritance of the elytra and pronotum colour in Adalia bipunctata. Trudy Laboratorii Genetiky, 9: 135-

162. (In Russian, English summary).

Lusis, J. J. 1947a. Some aspects of the population increase in Adalia bipunctata L. 1. Heterozygosity of populations in lethal alleles. Doklady Akademii Nauk USSR, 57: 825-828). (In Russian).

Lusis, J. J. 1947b. 2. Some aspects of the population increase in Adalia bipunctata (L.). The strains without males. Doklady Akademii Nauk USSR, 57: 951-954. (In Russian).

Lusis, J. J. 1961. On the biological meaning of color polymorphism of lady-beetle Adalia bipunctata (L.). Latvijas Entomologs, 4: 2-29. (In Russian, English summary).

Mader, L. 1924. Bestimmungs-Tabellen der europaeischen Coleopteren. 94. Heft. Coccinellidae, Tribus Scymnini. Tropau. 48 pp.

Mader, L. 1926-1937. Evidenz der palaearktischen Coccinelliden und ihrer Abrerrationen in Wort und Bild. Part 1. Zeitschrift des Vereines der Naturbeobachter, Wien. Supplements. 1926 (1): 1-24; 1927(2):25-48; 1928(3):49-76; 1929(4):77-124; 1930(5):124-168; 1931(6):169-204; Mader, L. 1955. (Above papers reprinted as a single volume with the same pagination).

Mader, L. 1958. Die amerikanischen Coccinelliden der Gruppe Synonychini. Annalen des naturhistorischen Museums in Wien, 62: 236-249.

Malkin, B. 1943. A catalogue of Oregon Coccinellidae.

Journal of the New York Entomological Society, 51: 191-198.

Malkin, B. 1949. Notes on Oregon Coccinellidae, Coleoptera. Journal of the New York Entomological Society, 57: 133-134.

Mann, W. M. 1911. On some northwestern ants and their guests. Psyche, 18: 102-109.

Mannerheim, C. G. 1843. Beitrag zur Käfer-fauna der Aleutischen Inseln, der Insel Sitka, und Neu Californiens. Bulletin de la Societe Imperiale des Naturalistes de Moscou, 16(2): 175-314.

Matthews, J. V. 1968. Palaeoenvironmental analysis of three Late Pleistocene coleopterous assemblages from Fairbanks, Alaska. Quaestiones Entomologicae, 4: 202-224.

Matthews, J. V. 1974. A preliminary list of insect fossils from the Beaufort formation, Meighen Island, District of Franklin. Geological Survey of Canada, Paper 74-1, Part A, pp. 203-206.

Matthews, J. V. 1975. Insects and plant macrofossils from two Quaternary exposures in the Old Crow-Porcupine Region, Yukon Territory, Canada. Arctic and Alpine Research, 7(3): 249-259.

Mayr, E. 1969. Animal species and evolution. Belknap Press, Harvard University; Cambridge. 798 pp.

McKenzie, H. L. 1936. An anatomical and systematic study of the genus Anatis of America (Coleoptera:

Coccinellidae). University of California, Publications in Entomology, 6(10):263-270.

McMullen, R. D. 1967. A field study of diapause in Coccinella novemnotata (Coleoptera: Coccinellidae). Canadian Entomologist, 99(1): 42-49.

Melsheimer, F. E. 1847. Descriptions of new species of Coleoptera of the United States. Proceedings of the Academy of Natural Sciences of Philadelphia, 3:158-181.

Merriam, C. H. 1892. The geographic distribution of life in North America with special reference to the Mammalia. Proceedings of the Biological Society of Washington, 7: 1-64.

Merriam, C. H. 1894. Laws of temperature control of the geographical distribution of terrestrial animals and plants. National Geographic Magazine, 6: 229-238.

Merriam, C. H. 1898. Life zones and crop zones of the United States. United States Department of Agriculture, Division of Biological Survey Bulletin, 10: 1-79.

Miyatake, M. 1961. The east-asian coccinellid beetles preserved in the California Academy of Sciences, tribe Hyperaspini. Memoirs of the Ehime University, section VI (Agriculture), 6(6): 147-155.

Motschulsky, V. 1845. Observations sur le Musee Entomologique de l'Universite Imperiale de Moscou. Bulletin de la Societe Imperiale des Naturalistes de Moscou, 18(2): 332-338.

Muesebeck, C. F. W., and K. V. Krombein, 1952. Life zone map. Systematic Zoology, 1(1): 24-25.

Mulsant, M. E. 1846. Histoire naturelle des Coleopteres de France: Sulcicolles-Securipalpes. Paris. xxiv + 280 pp.

Mulsant, M. E. 1850. Species de Coleopteres trimeres securipalpes. Annales des Science Physiques et Naturelles, d'Agriculture, ... Lyon; 2:1-1104. (Reprinted in 1851 as a separate volume with the same pagination).

Mulsant, M. E. 1853. Supplement a la monographie des coleopteres trimeres securipalpes. Opuscules entomologique, 3:1-178.

Mulsant, M. E. 1856. Additions et rectifications un catalogue des Coccinellides, publie en 1853. Annales Societe Linnaeus, Lyon; series 2, pp. 135-156.

Mulsant, M. E. 1866. Monographie des coccinellides. Memoires de l'Academie des Sciences Lyon, 15: 1-112.

Munroe, E. 1956. Canada as an environment for insect life. Canadian Entomologist, 88:372-476.

Newcomer, E. J. and M. A. Yother, 1929. Biology of the European red mite in the Pacific Northwest. United States Department of Agriculture, Washington, D. C. Technical Bulletin No. 89, 70 pp.

Nimmo, A. P. 1971. The adult Rhyacophilidae and Limnephilidae (Trichoptera) of Alberta and eastern British Columbia and their post-glacial origin. Quaestiones Entomologicae, 7(1):3-234.

Nunenmacher, F. W. 1909. Two new species of Coccinellidae

(Coleoptera). Entomological News, 22:161-162.

Nunenmacher, F. W. 1911. Studies amongst the Coccinellidae, No. 2. (Coleoptera). Entomological News, 22:71-74.

Nunenmacher, F. W. 1912a. The Stanford expedition to Brazil, 1911. J. C. Branner, Director. Studies amongst the Coccinellidae, No. 3. Psyche, 19:149-151.

Nunenmacher, F. W. 1912b. Studies amongst the Coccinellidae, No. 4. (Coleoptera). Entomological News, 23:448-451.

Nunenmacher, F. W. 1913. Studies amongst the Coccinellidae, No. 5. (Coleoptera). Entomological News, 24:76.

Nunenmacher, F. W. 1934a. A new and interesting species. Pan-Pacific Entomologist, 10:17-21.

Nunenmacher, F. W. 1934b. Studies amongst the Coccinellidae, No. 7. (Coleoptera). Pan-Pacific Entomologist, 10:113-114.

Nunenmacher, F. W. 1937. Studies among the Coccinellidae, No. 8. (Coleoptera). Pan-Pacific Entomologist, 13:182-183.

Nunenmacher, F. W. 1944. Studies among the Coccinellidae, No. 9. (Coleoptera). Pan-Pacific Entomologist, 20:144-146.

Nunenmacher, F. W. 1946. Studies among the Coccinellidae, No. 10. (Coleoptera). Pan-Pacific Entomologist, 22:72-73.

Nunenmacher, F. W. 1948. Studies among the Coccinellidae, No. 11. (Coleoptera). Pan-Pacific Entomologist, 24:6-8.

Olivier, A. G. 1808. Entomologie, ou histoire naturelle des insectes, avec leurs caracteres generiques et specifiques, leur description, leurs synonymie, et leurs figure enluminee. Coleopteres, vol. 5. Baudonin, Paris.

d'Orbigny, C. D. 1841-1849. Dictionnaire universel d'histoire naturelle, 13 vols. + 3 vols. plates. Paris.

Packer, J. G. and D. H. Vitt. 1974. Mountain Park: a plant refugium in the Canadian Rocky Mountains. Canadian Journal of Botany, 52(6): 1393-1409.

Palmer, M. A. 1911. Some notes on heredity in the coccinellid genus Adalia Mulsant. Annals of the Entomological Society of America, 4: 283-302.

Palmer, M. A. 1914. Some notes on life history of lady-beetles. Annals of Entomological Society of America, 7: 213-238.

Phuoc, D. T., and F. W. Stehr. 1974. Morphology and taxonomy of the known pupae of Coccinellidae (Coleoptera) of North America, with a discussion of phylogenetic relationships. Contributions of the American Entomological Institute, 10(6): 1-125.

Provancher, A. L. 1877. Petite faune entomologique du Canada. Volume 1. Coleopteres. Quebec. 700 pp.

Putman, W. L. 1955a. Bionomics of Stethorus punctillum Weise in Ontario. Canadian Entomologist, 87(1):9-33.

Putman, W. L. 1955b. The immature stages of Stethorus punctillum Weise (Coleoptera: Coccinellidae). Canadian

Entomologist, 87(1):506-508.

Randall, J. 1838a. Description of new species of coleopterous insects inhabiting the State of Maine. Boston Journal of Natural History, 2: 1-33.

Randall, J. 1838b. Descriptions of new species of coleopterous insects inhabiting the State of Massachusetts. Boston Journal of Natural History, 2: 34-52.

Redtenbacher, L. 1843. Tentamen dispositionis generum et specierum coleopterorum pseudotrirorum Archiducatus Austriae. Vindobonae. 32 pp.

Rees, B. E. 1947. Taxonomy of the larvae of some North American Noviini (Coleoptera, Coccinellidae). Pan-Pacific Entomologist, 23:113-119.

Richerson, J. V. 1970. A world list of parasites of Coccinellidae. Journal of the Entomological Society of British Columbia, 67:33-48.

Robinson, A. G. 1953. Notes on *Stethorus punctum* (LeC.) (Coleoptera: Coccinellidae), a predator of tetranychid mites in Manitoba. Annual Report of the Entomological Society of Ontario, 83: 24-26.

Rockwood, I. P. 1952. Notes on coccinellids in the Pacific Northwest. Pan-Pacific Entomologist, 28: 139-147.

Rohdendorf, B. B. 1962. Osnovy paleontologii, Academy of Sciences, Moscow. 566 pp. (In Russian).

Ross, H. H. 1974. Biological systematics. Addison-Wesley Publishing Company, Inc. Massachusetts. 1-345 pp.

Rowe, J. S. 1972. Forest regions of Canada. Department of Envirorment, Canadian Forestry Service Publication No. 1300, Ottawa. x + 172 pp.

Sasaji, H. 1968. Phylogeny of the family Coccinellidae. (Coleoptera). Etizenia, Occasional publication of the biological laboratory, Fukui University; Japan. 35:1-37.

Sasaji, H. 1971. Fauna Japonica. Coccinellidae (Insecta: Coleoptera). Academic Press of Japan, ix + 340 pp, xvi color plates.

Savojskaja, G. I. 1960. On morphology and taxonomy of ladybird larvae (Coleoptera: Coccinellidae) from south-east Kazakhstan. Entomologiceskoje Obozrenie, 29: 122-133. (In Russian with English summary).

Savojskaja, G. I. 1962. Morphology and taxonomy of the larvae of the genus Coccinella L. (Coleoptera: Coccinellidae). Trudy Instituta Zashistenija Rastenij, 7:299-315.

Savojskeja, G. I. 1963. Larvae of the coccinellid genera Semiadalia Crotch, Hippodamia Muls., Adonia Muls. and Anisosticta Dup., (Coleoptera). Trudy Instituta Zoologii Academii Nauk Kazakhstanskoj SSR., 21:74-95. (In Russian).

Savojskaja, G. I, 1964a. Materials on morphology and systematics of larvae of the tribe Coccinellini. Trudy Instituta Zashchistenija Rastenij, 8: 310-357. (In Russian).

Savojskaja, G. I. 1964b. On some larvae of the tribe Coelopterini and Hyperaspini, with a description of a new species (Col., Coccinellidae). Trudy Instituta Zashchistenija Rastenij, 8: 358-370. (In Russian).

Savojskaja, G. I. and B. Klausnitzer, 1973. Morphology and taxonomy of the larvae with keys for their identification. In Hodek et al, 1973. pp. 36-53. Loco citato.

Say, T. 1824. Descriptions of coleopterous insects collected in the late expedition to the Rocky Mountains, performed by order of Mr. Calhoun, Secretary of War, under the command of Major Long. Journal of the Academy of Natural Sciences of Philadelphia, vol. 4, part 1, pp. 83-99.

Say, T. 1926. Descriptions of new species of coleopterous insects inhabiting the United States. Journal of the Academy of Natural Sciences of Philadelphia, vol. 5, part 2, pp. 238-284; 293-304.

Say, T. 1835. Descriptions of new North American coleopterous insects, and observations on some already described. Boston Journal of Natural History, 1(2): 151-203.

Schaeffer, C. 1912. Coccinella undecimpunctata Linn. in Massachusetts. Psyche, 19: 104-105.

Schilder, F. A. and M. Schilder. 1928. Die Nahrung der Coccinelliden und ihre Beziehung zur Verwandschaft der Arten. Arbeiten der Biologische Reich Anst. Land-und

Forstwirtschaft, 16: 213-282.

Schwarz, E. A. 1890. Myrmecophilous Coleoptera found in temperate North America. Proceedings of the Entomological Society of Washington, 1: 237-247.

Schwarz, E. A. 1904. A new coccinellid enemy of the San Jose scale. Proceedings of the Entomological Society of Washington, 4: 118-119.

Scott, F. T. 1933. Additions to the Coccinellidae of Alaska. Pan-Pacific Entomologist, 9: 126.

Sharma, M. L. and P. Martel, 1972. Some notes on *Microweisea marginata* (LeConte), (Coleoptera: Coccinellidae), predator of the pine needly scale *Phenacaspis pinifoliae* (Fitch). Folia Entomologica Mexicana, 23-24: 122-123.

Sharp, D. and F. Muir, 1912. The comparative anatomy of the male genital tube in Coleoptera. Transactions of the Royal Entomological Society, London (1912): pp. 477-639.

Shelford, V. E. 1932. Life zones, modern ecology, and the failure of temperature summing. Wilson Bulletin, 44: 144-157.

Shull, A. F. 1943. Inheritance in lady beetles. I. The spotless and spotted elytra of *Hippodamia sinuata*. Journal of Heredity, 34: 329-337.

Shull, A. F. 1944. Inheritance in lady beetles. II. The spotless pattern and its modifiers in *Hippodamia convergens*, and their frequency in several populations.

Journal of Heredity, 35: 329-339.

Shull, A. F. 1945. Inheritance in lady beetles. III. Crosses between variants of Hippodamia quinquesignata and between this species and H. convergens.

Shull, A. F. 1946a. Inheritance by lady beetles. IV. The forms of the chitinous male genitalia in crosses of the species Hippodamia quinquesignata and H. convergens. Genetics, 31: 291-303.

Shull, A. F. 1946b. The standards by which the spotless phase of Hippodamia convergens is judged. Annals of the Entomological Society of America, 39: 190-192.

Shull, A. F. 1948. Natural hybrids of subspecies of Hippodamia quinquesignata. Evolution, 2: 10-18.

Smith, S. G. 1959. The cytogenetic basis for speciation in Coleoptera. Proceedings of the 10th International Congress of Genetics; Montreal (1956). Vol. 1, pp. 444-450.

Smith, S. G. 1960. Cytogenetics of insects. Annual Review of Entomology, 5:69-84.

Smith, S. G. 1962. Tempero-spatial sequentiality of chromosomal polymorphism in Chilocorus stigma Say (Coleoptera: Coccinellidae). Nature, 193: 1210-1211.

Smith, S. G. 1966. Natural hybridization in the coccinellid genus Chilocorus. Chromosoma, 17:379-406.

Stehr, W. C. 1930. The Coccinellidae (ladybeetles) of Minnesota. Minnesota University Technical Bulletin, 75:5-54.

Strouhal, H. 1927. Die Larven der Palaearktischen Coccinellini und Psyllohorini. (Coleopt.). Archiv für Naturgeschichte, 92 (A3): 1-63.

Thunberg, C. P. 1794. Dissertatio entomologica sistens Insecta Suecica. Upsaliae. Part 5, pp. 63-72.

Timberlake, P. H. 1919. Notes on the American species of Hippodamia (Coleoptera). Journal of the New York Entomological Society, 27:162-174.

Timberlake, P. H. 1920. Revision of the parasitic chalcoid flies of the genera Homalotylus Mayr and Isodromus Howard, with descriptions of two closely related genera. Proceedings of the United States National Museum, 56: 133-194.

Timberlake, P. H. 1939. A new species of Hippodamia from Mt. Rainier (Coleoptera: Coccinellidae). Proceedings of the Hawaiian Entomological Society, 10(2): 265-266.

Timberlake, P. H. 1943. The Coccinellidae or ladybeetles of the Koebele collection. Part 1. Bulletin of the Experimental Station, Hawaiian Sugar Planters' Association, Entomological series, 22:1-67.

Udvardy, M. D. F. 1969. Dynamic Zoogeography with special reference to land animals. Van Nostrand Reinhold Co., New York. xviii +445 pp.

Van Dyke, E. C. 1919. The distribution of insects in western North America. Annals of the Entomological Society of America, 12(1): 1-12.

Van Dyke, E. C. 1926. Certain peculiarities of the coleopterous fauna of the Pacific Northwest. Annals of the Entomological Society of America, 19(1): 1-12.

Vaundell, W. L. and R. H. Storch. 1972. Food list of *Hippodamia* (Coleoptera: Coccinellidae). University of Maine, Orono. Life Sciences and Agriculture Experiment Station. Technical Bulletin No. 55. 19 pp.

Verhoeff, C. 1895. Beitrag zur vergleichende Morphologie des Abdomens der Coccinellidae. Archives fur Naturgeschichte, 61:1-80.

Watson, W. Y. 1954. Two new species of Coccinellidae (Coleoptera). Canadian Entomologist, 86(1): 45-47.

Watson, W. Y. 1956. A study of the phylogeny of genera of the tribe Coccinellini (Coleoptera). Contributions of the Royal Ontario Museum, Division of Zoology and Palaeontology, 42:1-52.

Weed, C. M. 1889. On the predatory stages of the 20-spotted lady-bird (*Psyllobora 20-maculata*, Say). Bulletin of the Ohio Agricultural Experimental Station, Technical series, 1(1): 1-4.

Weise, J. 1887. Feststellung der Gattung *Coelopterus* Mulsant. Deutsche entomologische Zeitschrift, 31: 183-185.

Weise, J. 1891. Neue Coccinelliden. Deutsche Entomologische Zeitschrift, 4: 282-288.

Wheeler, W. M. 1911. Ant-nest coccinellid (*Brachyacantha quadripunctata*) Melsh. Journal of the New York Entomological Society, 19:169-174.

Wickham, H. F. 1917. New species of fossil beetles from Florissant, Colorado. Proceedings of the United States National Museum, 52:463-472.

Wickham, H. F. 1894. The Coleoptera of Canada. V. The Coccinellidae of Ontario and Quebec. Canadian Entomologist, 26(11): 297-306.

Willis, H. L. 1967. Bionomics and zoogeography of tiger beetles of saline habitats in the central United States (Coleoptera: Cicindelidae). The University of Kansas, Science Bulletin; 47(5): 145-313.

Wilson, E. O. and W. L. Brown, Jr. 1953. The subspecies concept and its taxonomic application. Systematic Zoology, 2: 97-111.

Wilson, J. W. 1930. The genitalia and wing-venation of Cucujidae and related families. Annals of the Entomological Society of America, 23:305-341.

Wingo, C. W. 1952. The Coccinellidae (Coleoptera), of the Upper Mississippi basin. Iowa State College Journal of Science, 27:15-53.

Wright, H. E. Jr., and D. G. Frey (editors). 1965. The Quaterrary of the United States. A review volume for the VII Congress of the International Association of Quaternary research. Princeton Univerity Press, New Jersey. 922 pp.

Yosida, T. H. 1956. Variation in elytral pattern of the convergent lady-bird (Hippodamia convergens) collected in Colorado. Annotationes Zoologicae Japonenses, 29(2):

101-103.

AUTOBIOGRAPHICAL NOTE

Born on February 6th, 1948 in Gottwaldov-Zlin (Czechoslovakia), I spent most of my pre-school days on the farm of my grandfather. It was grandfathers' bees which sparked my interest in insects. I have happy memories about the long hours devoted to watching these seemingly tireless creatures. Becoming a beekeeper myself at the age of ten I kept several colonies as a hobby until my immigration to Canada in the fall of 1968.

The industrial Czechoslovakia channeled my formal education into mechanical engineering. Upon finishing high school in Vizovice, I enrolled at Engineering College in Uherske Hradiste, to specialize in aeronautical design. Four years later I transferred at the Technical University of Brno, where my studies were interrupted by the Russian invasion of Czechoslovakia in August of 1968. At that time I decided to leave the country and chose Canada to be my future home. In 1973 I became a Canadian citizen.

Planes always fascinated me and to date I maintain keen interest in aircrafts, especially helicopters. In fact, my first job upon arriving in Canada was a draftsman, designer position with the Falconar Aircraft Ltd., at the Industrial Airport in Edmonton. For two years I was a flying member of the Edmonton Flying Club, but since September of 1970 when I started to study entomology at the University of Alberta, I gave up active membership.

My other interests include the study of languages. From grade four I was taking Russian for 12 subsequent years. Ever since highschool, I spent the summers travelling Europe. At that time I began to learn German. During summers 1966-67, my knowledge of German was sufficient to take a job as a machinist in a factory manufacturing cameras in Dresden, East Germany. Because of the similarity, I understand most Slavic languages, though I am by no means fluent.

From about teenage years, I accompanied my father at his part-time job as an executive, and later a president of a regional Czech Wildlife Association. During this time I learned a lot about game management, planning, animals themselves, and even guns and marksmanship.

The engineering training provided me with the necessary background and experience with computers. For a number of years, I was interested, and still am, in application of electronic data processing to systematics; particularly information storage and retrieval. To a lesser degree I worked on problems involving numerical taxonomic techniques.

On September 16th, 1972 I married Wendy E. Parris. We do not have any children yet. Her profession as a microbiologist naturally complements my interests in entomology.

COCCINELLIDAE OF WESTERN CANADA AND ALASKA WITH ANALYSES OF TRANSMONTANE ZOOGEOGRAPHIC RELATIONSHIPS BETWEEN THE FAUNA OF BRITISH COLUMBIA AND ALBERTA

(INSECTA: COLEOPTERA: COCCINELLIDAE)

7.0 APPENDIX "A"

LOCALITY DATA FOR SPECIMENS STUDIED

Explanatory remarks.- The following is a list of localities and other specimen associated data for coccinellids studied by the author. For each species, the localities are listed alphabetically, under headings of provinces or states. For each locality, the date of capture plus any other recorded field observations are given, followed by (in brackets) the number of specimens from this locality, and a code for collections where are these specimens currently housed. A directory of collections and their codes is given in section 2.1 Materials.

3.4.1 Microweisea marginata (LeConte)

ALBERTA:

Seebe, 15.VIII.1964 (2,JCarr). Tp. 6, Rge. 4, W5 Mer., 27.VII.1963 (2,JCarr). Waterton, /washup/ (4,UASM).

BRITISH COLUMBIA:

Creston, 21.VI.1953 (1,UBC). Renalto, 03.VII.1945 (1,UBC).

3.4.2 *Microweisea misella* (LeConte)

ALBERTA:

Calgary, 09.IX.1950 (1,JCarr). Fort McLeod, 05.VIII.1958 (1,JCarr). Medicine Hat, 01.VI.1953 (1,JCarr).

BRITISH COLUMBIA:

Burton, 30.VI. 1959 (1,UBC). Gallaher Lake, 4mi. n. Oliver, 19.IX.1957 (1,CDAS).

SASKATCHEWAN:

Balcarres, VII.1965 (1,PMRS). Punnichy, 17.V.1965 (1,PMRS).

3.5.1 *Stethorus picipes* Casey

BRITISH COLUMBIA:

Creston, IX.1960 (1,UBC); 23.VI.1952 (1,UBC); 25.IX.1931 (1,CNC). Copper Mountain, 06.VI.1930 (3,UBC). Erickson, 26.X.1974 (4,UBC). Lakehead, 08.VIII.1970 (1,CDAS). Peachland, 28.VII.1947 (4,CDAS; 10,CNC). Summerland, 04.VIII.1955 (2,CDAS); 04.IX.1970 (3,CDAS); 12.IX.1949 (2,CDAS); 25.IX.1931 (1,CNC). South Okanagan, VI.1951 (3,UBC). Terrace, (2,UBC). Vancouver, 28.XII.1953 (1,UBC); 06.IX.1954 (2,UBC). Victoria, 01.VIII.1923 (1,UBC).

3.5.2 *Stethorus punctillum* Weise

BRITISH COLUMBIA:

Lulu Island, 12.VII.1950 (2,CNC). Mission City, 26.VI.1953 (12,CNC). Vancouver, 06.IX.1954 /on *Rubus* / (2,UBC).

3.6.1 *Didion longulum* Casey

ALBERTA:

Calgary, 05.VIII.1958 (5,JCarr); 16.VI.1956 (1,JCarr); 30.VI.1957 (1,JCarr). Cochrane, 12.VI.1960 (1,JCarr). Cypress Hills, 29.VII.1964 (1,JCarr). Ghost Dam, 13.VI.1973 (7,JCarr). Medicine Hat, 18.V.1970 (3,JCarr); 01.VI.1963 (1,JCarr). Peace River, 22.VI.1966 (1,JBel). Sundre, 15.VI.1973 (1,JCarr). Tp. 20, Rge. 1, W4 Mer., 02.VII.1973 (1,JCarr). Waiparous, 404.VII.1954 (2,JCarr).

YUKON:

Mayo, 04.VII.1955 (1,JCarr).

3.6.2 *Didion nanus* (LeConte)

ALBERTA:

Medicine Hat, 18.VI.1924 (1,UASM).

3.6.3 *Didion punctatum* (Melsheimer)

ALBERTA:

Medicine Hat, 20.VI.1926 (2,UASM).

3.7.1 *Scymnus* (*Scymnus*) *apicanus* Chapin

ALBERTA:

Edmonton, 19.VII.1923 (1,UASM); /paratype/. Calgary, 03.VI.1963 (1,JCarr). Hussar, 24.X.1959 (1,JCarr). Tp. 26, Rge. 3, W5 Mer., 08.IV.1961 (1,JCarr).

3.7.2 *Scymnus* (*Scymnus*) *paracanus* Chapin

ALBERTA:

Bassano Dam, 10.VI.1970 (1,JBel). Calgary, 22.V.1963 (1,JCarr). Sundre, 12.IV.1959 (1. Tp. 14, Rge. 3, W4 Mer., 13.VI.1963 (1,JCarr).

3.7.3 *Scymnus* (*Scymnus*) *opaculus* Horn

ALBERTA:

Medicine Hat, 21.VII.1962 (1,JCarr).

3.7.4 *Scymnus* (*Scymnus*) *phelpsi* Crotch

BRITISH COLUMBIA:

Caulfield, 17.VIII.1930 (1,UBC). Duncan, Genoa Bay, 19.VI.1928 (1,UBC); /no other data/ (3,UASM). Glen Lake, Vancouver I., 17.VI.1946 (2,UBC). Malahat, 21.IX.1938 (2,UBC). Nanaimo, Departure Bay, 10.VI.1925 (2,UBC). Pender Harbor, 21.VI.1929 (7,UBC). Royal Oak, Vancouver I., 29.VI.1953 (1,UBC). Saanich Peninsula, north end 04.VII.1946 (1,UBC). Vancouver, 10.V.1931 (1,UBC). Victoria, 08.VII.1962 (1,JCarr).

3.7.5 *Scymnus* (*Scymnus*) *caurinus* Horn

BRITISH COLUMBIA:

Copper Mountain, 27.VI.1929 (1,UBC). Creston, 15.III.1953 (1,UBC); 02.VI.1952 (1,UBC); 08.VI.1952

(1,UBC); 19.VI.1931 (1,UBC); 31.X.1952 (1,UBC); 11.XI.1931 (1,UBC). Goldstream, 15.IX.1925 (1,UBC).

CALIFORNIA:

Leggett, 14.VII.1965 (1,JCarr).

IDAHO:

Cuprum, 04.VII.1968 (1,JCarr).

UTAH:

Cedar, 28.VII.1970 (1,JCarr).

3.8.1 *Scymnus* (*Pullus*) *postpinctus* Casey

ALBERTA:

Beaver Creek, 22.V.1936 (1,UASM). Calgary, 30.VI.1959 (1,JCarr). Durward, 28.VII.1956 (1,JCarr). Fort MacLeod, 26.VII.1958 (1,JCarr). Ghost Dam, 20.VI.1971 (1,JCarr). Medicine Hat, V.-VIII. (many, UASM, JCarr). Pincher, 08.IV.1963 (1,JCarr). Tilley, 09.X.1961 (1,JCarr). Tp. 11, Rge. 11, W4 Mer., 028.V.1970 (1,JCarr).

BRITISH COLUMBIA:

WYOMING:

Atlantic City, 07.VII.1970 (1,JCarr). South Pass City, 07.VII.1970 (1,JCarr).

3.8.2 *Scymnus* (*Pullus*) *marginicollis* Mannerheim

BRITISH COLUMBIA:

Copper Mountain, 12.VII.1929 (1,UBC). Midday Valley, Merritt; 16.VII.1925 (5,UBC). Penticton, 23.IX.1927 (2,UBC).

CALIFORNIA:

Berkeley, no other data; (1,UASM). Fort Bragg, 17.VII,1965 (2,JCarr). Garberville, 13.VII.1965 (3,JCarr). Loleta, 12.VIII.1965 (3,JCarr). Santa Monica, 18.V.1962 (1,UASM).

3.[illegible].3 Scymnus (Pullus) carri Gordon

ALBERTA:

Calgary, 22.VI.1958 (2,JCarr). Fort Macleod, 15.VII.1961 (1,JCarr). Medicine Hat, 16.V.1931 (1,USNM); /holoptype/. 02.VI.1963 (2,JCarr). Pincher Creek, 15.VII.1929 (3,UASM). Tp. 21, Rge. 25, W4 Mer,, 27.VI.1964 (2,JCarr). Tp. 22, Rge. 1, W4 Mer., 06.VIII.1972 (1,JCarr).

SASKATCHEWAN:

Webb, 24.VII.1968 (1,JCarr).

3.8.4 Scymnus (Pullus) aquilonarius Gordon

ALBERTA:

Diamond Head, 12.VIII.1925 (1,USNM).

3.8.5 Scymnus (Pullus) lacustris LeConte

ALBERTA:

Banff, 01.VIII.1926 (1,UASM). Beaver Creek, 22.V.1926 (2,UASM). Calgary, 04.VII.1953 (2,JCarr); 19.VIII.1955 (2,JCarr). Cypress Hills, 25.V.1925 (4,UASM). Edmonton, 27.VI.1928 (10,UASM). Empress, 04.VI.1926 (3,UASM). Happy Valley, 25.V.1928 (1,UASM). Macleod, 28.VIII.1924 (8,UASM).

Medicine Hat, 05.IX.1924 (2,UASM); Mundare, 20.VI.1922 (1,UASM). Pincher Creek, 22.VI.1926 (8,UASM). Tilley, 06.VIII.1955 (1,JCarr). Tp. 6, Rge. 4, W5 Mer., 09.VII.1961 (1,JCarr). Waiparous, 28.VI.1957 (1,JCarr).

BRITISH COLUMBIA:

Cranbrook, 28.VII.1956 (1,JCarr); 01.VII.1929 (1,UASM). Creston, 09.VII.1952 (1,UBC). Deadman Pass, 14.VII.1961 (1,JCarr). Midway, 12.VII.1962 (2,JCarr). Oliver, 30.VII.1956 (1,JCarr). Radium, 04-6.VI.1953 (3,JCarr). South Slocan, 12.VII.1962 (1,JCarr).

3.8.6 *Scymnus* (*Pullus*) *coniferarum* Crotch

BRITISH COLUMBIA:

Creston, 18.VIII.1947 (1,UBC). Penticton, 23.IX.1927 (4,UBC).

3.8.7 *Scymnus* (*Pullus*) *ardelio* Horn

BRITISH COLUMBIA:

Vancouver, V.-IX. (many, UBC, WUSP).

3.8.8 *Scymnus* (*Pullus*) *calaveras* Casey

BRITISH COLUMBIA:

Duncan, (3,UASM). Hope, 04.VII.1965 (1,JCarr). Paulson, 12.VII.1962 (1,JCarr).

3.9.1 *Nephus ornatus* LeConte

ALBERTA:

Medicine Hat, 05.VII.1956 (1,UASM).

3.9.2 Nephus georgei (Weise)

ALASKA:

Deering, (1,USNM).

ALBERTA:

Edmonton, 20.VI.1964 (5,UASM). Calgary, 14.VI.1953 (1,JCarr).

3.9.3 Nephus sordidus Horn

ALBERTA:

Calgary, 01.I.1953 (1,JCarr); 16.III.1973 (1,JCarr); 26.VI.1963 (1,JCarr); 08.VI.1960 (JCarr). Drumheller, 02.VIII.1963 (1,JCarr). Edmonton, 13.IX.1919 (2,UASM); 02.VII.1970 (1,JBel). Ghost Dam, 31.V.1972 (1,JCarr). Medicine Hat, 18.V.1970 (2,JCarr). Waiparous, 04.VII.1954 (4,JCarr). Tp. 29, Rge. 5, W5 Mer., 06.V.1962 (1,JCarr).

3.10.1 Hyperaspidius hercules, new species

ALBERTA:

Medicine Hat, 02-3.VII.1932 (2,UASM); paratypes: 03.VI.1963 (1,JCarr). Tp. 1, Rge. 5, W4 Mer., 08.VII.1973 (1,JCarr). Tp. 2, Rge. 5, W4 Mer., 28.VII.1964 (1,JCarr).

MONTANA:

Winnett, 3mi. nw., Petroleum Co; 16.VI.1969 (1,USNM).

3.10.2 *Hyperaspidius vittigerus* (LeConte)

ALBERTA:

Bragg Creek, 11.VII.1959 (1,JCarr). Calgary, 29.V.1963 (1,JCarr). Comrey, 21.VII.1960 (1,JCarr). Cypress Hills, 25.VI.1927 (2,UASM). Drumheller, 02.VII.1963 (1,JCarr). Elkwater, 13.VII.1952 (2,CNC). Edmonton, 30.VI.1926 (1,USNM). Irvine, 23.V.1952 (1,CNC). Medicine Hat, V.-VII. (many,UASM, USMM, CNC). Manyberries, 03.VI.1952 (2,CNC). Waiparous, 12.VII.1953 (1,JCarr).

BRITISH COLUMBIA:

Cawston, VII. 1917 (1,CNC). Chilcotin, VI. 1929 (1,UBC). Lac du Bois, nr. Kamloops; 14.VI.1963 (3,UBC). Naramata, 28.V.1958 (1,CNC). Oliver, 5mi. nw; 11.VI.1958 (1,CNC). Summerland, 26.V.1933 (1,CNC). White Lake, VII.1927 (1,CNC). Wycliffe, 20.VII.1958 (6,UBC).

YUKON:

Whitehorse, 27.VIII.1959 (1,CNC).

3.10.3 *Hyperaspidius arcuatus* (LeConte)

CALIFORNIA:

Kaweah, III.1936 (1,USNM).

BRITISH COLUMBIA:

Summerland, 26.V.1936 (1,CNC). Wycliffe, 28.VII.1958 (1,UBC).

OREGON:

Halfway, 06.VII.1968 (1,JCarr).

3.11.1 *Hyperaspis lateralis* Mulsant

ALBERTA:

Calgary, 08.VII.1959 (1,JCarr). Irvine, 12.VIII.1959 (1,JCarr). Medicine Hat, 07.VIII.1958 (5,JCarr); 22.VIII.1924 (4,UASM). Tp. 13, Rge. 12, W4 Mer., 02.IX.1968 (1,JCarr).

BRITISH COLUMBIA:

Kamloops, 27.IX. 1932 (1,UBC). Lytton, 28.VI.1931 (1,UBC). Meyer's Flat, Oliver; 02.V.1957 (4,CDAS). Summerland, 15.IX.1957 (2,CDAS). Vernon, 08.IV.1938 (1,UBC); 17.V.1957 (1,UBC).

SASKATCHEWAN:

Killdeer, 07.VIII.1974 (1,PMRS). Waskesieu, 10.VI.1938 (1,PMRS).

WYOMING:

Converse County, Little Box Elder Creek; 29.VII.1956 (2,UCB); 5-6.VIII.1949 (1,UCB).

3.11.2 *Hyperaspis fastidiosa* Casey

ALBERTA:

Medicine Hat, 16.VI.1929 (2,UASM); 26.VI.1924 (2,UASM); 07.VIII.1958 (1,JCafr). Tp. 13. Rge. 12, W4 Mer., 02.IX.1968 (1,JCarr).

BRITISH COLUMBIA:

Summerland, 29.VII.1920 (4,CDAS).

3.11.3 *Hyperaspis postica* LeConte

ALBERTA:

Medicine Hat, 24.V.1927 (1,JCarr).

BRITISH COLUMBIA:

Creston, 03.VI.1946 (1,UBC); 11.V.1947 (1,UBC). Lytton, 19.VII.1931 (2,UBC). Sanca, 10.V.1933 (1,UBC). Summerland, 31.V.1957 (1,CDAS).

3.11.4 Hyperaspis fimbriolata (Melsheimer)

ALBERTA:

Aden, 20.VII.1960 (1,JCarr). Bassano Dam, 15.VI.170 (2,JBel). Calgary, 07.VIII.1960 (5,JCarr). Cypress Hills, 25.VI.1927 (3,UASM). Drumheller, 21.VI.1957 (1,JCarr). Edmonton, 29.V.1920 (1,UASM). Ghost Dam, 01.VII.1964 (4,JCarr). Jenner, 13.V.1927 (1,UASM). Medicine Hat, 18.V.1970 (1,JCarr); 27.VII.1921 (8,UASM).

SASKATCHEWAN:

Punnichy, 09.VI.1965 (1,PMRS).

3.11.5 Hyperaspis quadrivittata LeConte

ALBERTA:

Aden, 20.VII.1960 (1,JCarr). Calgary, 19.V.1961 (1,JCarr). Cypress Hills, 04.VI.1932 (1,UASM). Drumheller, 21.VI.1954 (2,JCarr). Edmonton, 13.V.1922 (1,UASM). Medicine Hat, IV.-VIII. (many, UASM, JCarr). Tp. 10, Rge. 27, W4 Mer., 22.V.1965 (1,JCarr). Tp. 20, Rge. 29, W4 Mer., 21.VI.1964 (1,JCarr). Waiparous, 30.VI.1960 (1,JCarr). Waterton, 03.VIII.1932 (2,UASM).

BRITISH COLUMBIA:

Cranbrook, 08.VI.1961 (1,UBC). Nicola, 30.VI.1932 (1,UBC).

SASKATCHEWAN:

Punnichy, 20.V.1964 (1,PMRS).

WASHINGTON:

Moses Canyon, 22.VII.1928 (1,UASM).

WYOMING:

South Pass City, 07.VII.1970 (1,JCarr).

3.11.6 *Hyperaspis elliptica* Casey

ALBERTA:

Medicine Hat, 02.VI.1963 (1,JCarr).

BRITISH COLUMBIA:

Creston, 03.V.1947 (2,UBC). Hat Creek, 20.VIII.1933 (2,UBC). Lytton, 19.VIII.1921 (2,UBC). Penticton, 11.VIII.1970 (1,UBC). Salmon Arms, 03.VI.1929 (1,UBC). Summerland, 31.V.1957 (1,UBC).

3.11.7 *Hyperaspis undulata* (Say)

BRITISH COLUMBIA:

Creston, 1-15.VIII.1947 (1,UBC).

SASKATCHEWAN:

Kandahar, 14.VIII.1968 (1,PMRS).

3.11.8 *Hyperaspis oregona* Dobzhansky

ALBERTA:

Cypress Hills, 08.V.1926 (1,UASM). Medicine Hat, 30.V.1931 (1,UASM).

IDAHO:

Geneva, 11.VIII.1966 (8,JCarr).

3.11.9 *Hyperaspis lanei* Hatch

BRITISH COLUMBIA:

Creston, 03.V.1945 (3,UBC); 05.V.1945 (3,UBC); 07.V.1957 (1,UBC); 08.V.1945 (1,UBC); 23.V.1945 (1,UBC); /all paratypes/.

3.11.10 *Hyperaspis dissoluta* Crotch

BRITISH COLUMBIA:

Nicola, 30.VIII.1925 (1,UBC).

IDAHO:

Pettit Lake, 13.VII.1968 (1,JCarr).

3.11.11 *Hyperaspis simulatrix* Dobzhansky

ALBERTA:

Bassano Dam, 15.VI.1970 (1,JBel). Medicine Hat, 23.V.1931 (1,UASM). 02.VI.1963 (1,JCarr); 07.VIII.1958 (1,JCarr); 14.VIII.1921 (1,UASM). Tp. 13, Rge. 12, W4 Mer., 02.IX.1968 (1,JCarr).

BRITISH COLUMBIA:

Creston, 03.V.1945 (1,UBC).

SASKATCHEWAN:

Killdeer, 07.VIII.1967 (1,PMRS). Mortlach, 17.VIII.1959

(1,JCarr).

3.11.12 Hyperaspis lugubris (Randall)

ALBERTA:

Calgary, 30.VI.1964 (3,JCarr). Coleman, 16.VI.1961 (1,JCarr). Ghost Dam, 31.V.1972 (6,JCarr). Medicine Hat, 12.IV.1963 (1,JCarr); 15.IV.1926 (1,UASM); 02.VI.1932 (1,UASM). Turner Valley, 11.VI.1959 (1,JCarr). Waiparous, 05.VI.1953 (2,JCarr).

BRITISH COLUMBIA:

Elko, 03.VIII.1958 (1,JCarr).

3.11.14 Hyperaspis jasperensis, new species

ALBERTA:

Jasper National Park, Bald Hills; VII.-VIII.1970 (10,JBel).

3.12.1 Brachiacantha ursina (Fabricius)

ALBERTA:

Calgary, 14.VII.1953 (1,JCarr); 14.VII.1959 (1,JCarr). Cochrane, 23.VI.1963 (1,JCarr). Edmonton, 25.VI.1921 (2,UASM); 11.VII.1918 (1,UASM); 09.VII.1918 (1,UASM). Lethbridge, VI.1928 (1,UASM). Medicine Hat, 09.VI.1962 (1,JCarr); 21.VI.1920 (1,UASM). Pincher Creek, 15.VII.1929 (2,UASM). Red Deer, 05.VII.1959 (1,JCarr). Tp. 21, Rge. 25, W4 Mer., 27.VI.1964 (1,JCarr). Tp. 1, Rge. 5, W4 Mer., 04.VII.1973 (3,JCarr).

BRITISH COLUMBIA:

Aspen Grove, 03.VII.1932 (1,UBC). Copper Mountain, 20.VII.1930 (2,UBC). Creston, 22.VII.1951 (1,UBC). Invermere, 20.VI.1957 (1,UBC). Kamloops, 11.VI.1944 (7,UBC). Meyer's Flats, Oliver, 20.VI.1956 (2,CDAS). Radium, 06.VI.1949 (3,NFRC). Vinsulla, 28.VI.1962 (1,UBC). Wynndel, 09.VII.1933 (3,UBC).

SASKATCHEWAN:

Killdeer, 11.VII.1974 (1,PMRS). Yorkton, 01.VII.1948 (1,PMRS).

3.13.1 *Chilocorus stigma* (Say)

ALBERTA:

Coleman, 23.VI.1958 (6,NFRC). Cypress Hills, 26.VIII.1925 (9,UASM). Edmonton, 20.V.1921 (1,UASM). Ghost Dam, 30.V.1973 (2,JCarr). Grande Prairie, 20.IX.1966 (12,NFRC). Hillcrest, 18.VI.1956 (6,NFRC). Hussar, 12.IX.1959 (1,Carr). Medicine Hat, 01.X.1928 (4,UASM). Pincher Creek, 05.VI.1969 (1,JCarr). Red Deer, 05.VII.1959 (1,JCarr). South Fork River, 24.VII.1928 (1,UASM). Warspite, 24.IX.1959 (8,NFRC). Waterton, 10.VI.1930 (8,UASM).

SASKATCHEWAN:

Craven, 29.V.1967 (1,PMRS). Cypress Hills, 07.IX.1967 (2,PMRS). Fort Qu'Appelle, 28.IX.1968 (1,PMRS). Good Spirit Park, 23.VII.1968 (1,PMRS). Kandahar, 01.VIII.1968 (1,PMRS).

3.13.2 *Chilocorus tricyclus* Smith

BRITISH COLUMBIA:

Brisco, 26.VIII.1953 (1,JCarr). Creston, 12.VII.1964 (1,JCarr); 05.VI.1947 (2,UBC). Elko, 29.VII.1958 (1,JCarr). Kootenay Lake, 04.VIII.1964 (1,JCarr). Okanagan Center, 24.IV.1953 (22,CDAS). Penticton, 05.X.1931 (1,UBC). Phillips Canyon, 21.VI.1936 (1,UBC). Radium, 29.V.1958 (1,NFRC); 04.VI.1953 (2,JCarr). Sinclair Canyon, 29.V.1958 (4,NFRC). Summerland, 25.VII.1957 (1,UBC). Vancouver, 31.VI.1931 (1,UBC). Vernon, 19.VIII.1931 (3,CDAS).

3.13.3 *Chilocorus hexacyclus* Smith

ALBERTA:

Medicine Hat, 03.VII.1956 (4,CNC).

SASKATCHEWAN:

Conquest, 14.VII.1956 (15, CNC).

3.14.1 *Exochomus aethiops* (Bland)

ALBERTA:

Comrey, 21.VII.1960 (1,JCarr). Cypress Hills, 29.VII.1930 (1,UASM). Ghost Dam, 03.X.1965 (12,JCarr); 18.VIII.1963 (1,JCarr). Medicine Hat, 28.VII.1929 (1,UASM).

3.15.1 *Brumoides septentrionis* (Weise)

ALBERTA:

Bassano Dam, 10.VI.1970 (1,JBel). Bikerdike, 12.VIII.1949 (1,NFRC). Calgary, 28.VII.1957 (3,JCarr). Canmore, 04.IV.1953 (1,JCarr). Coleman, 13.VI.1950 (1,NFRC); 23.VI. 1958 (1,NFRC). Crowsnest, 28.VIII.1949 (2,NFRC). Cypress Hills, 04.VI.1922 (3,UASM). Drumheller, 21.VI.1954 (1,JCarr). Edson, 14.VIII.1950 (1,NFRC). Elkwater, 15.VI.1955 (1,UASM). Ghost Dam, 16.VII.1953 (1,JCarr). Gleichen, 25.III.1956 (1,JCarr). Gull Lake, 08.VI.1929 (1,UASM). Island Lake, 11.IX.1963 (1,NFRC). Jasper, 28.VIII.1949 (1,NFRC). Jenner, 13.V.1927 (1,UASM). Jumpingpound Creek, 19.VI.1950 (1,NFRC). Kananaskis Lakes, 19.VII.1958 (1,JCarr). MacLeod, 24.VII.1924 (1,UASM). Manyberries, 08.VIII.1949 (1,UASM). Medicine Hat, 25.VII.1924 (4,UASM); 11.IV.1925 (1,UASM). Peers, 14.VI.1951 (1,NFRC). Ralston, 50° 16'N, 111° 34'W ; 12.V.1955 (1,UASM). Slave Lake, 4mi. n; beach drift- Lesser Slave Lake; 07.VI.1975 (1,JBel). Sylvan Lake, 17.VIII.1969 (1,JCarr). Tilley, 06.VIII.1955 (6,JCarr). Waterton, 20.VII.1949 (1,NFRC).

BRITISH COLUMBIA:

Elko, 03.VIII.1958 (3,JCarr). Mount Korau, 02.IX.1970 (1,CDAS). Radium, 10.VIII.1950 (1,NFRC). Richter Pass, 24.IV.1941 (2,UASM); 30.IV.1965 (3,UBC). Summerland, 18.VI.1937 (1,UASM). Vaseux Lake, 02.IX.1970 (1,CDAS). Vernon, 08.III.1938 (2,UBC); 08.III.1928 (1,NFRC). Walhachin, 28.VII.1965 (4,JCarr). Wasa, 26.VII.1958 (1,UBC).

SASKATCHEWAN:

Fort Qu'Appelle, IX.1973 (1,PMRS). Kandahar, 05.VII.1968 (1,PMRS); 01.VIII.1968 (1,PMRS). Lac La Ronge, 11.IX.1969 (1,Jbel) on Pinus banksiana. Stony Rapids, 24.VI.1975 (1,PMRS). White Fox, 22.VI.1960 (1,JBel) on Picea glauca. Winter, 12.VI.1970 (1,PMRS).

3.16.1 Coccidula occidentalis Horn

ALASKA:

Deadman Lake, AH mi. 1249; 6-7.VII.1968 (23,CNC).

ALBERTA:

Cypress Hills, 04.VI.1937 (1,CNC). Edmonton, 03.VI.1920 (1,UASM); 01.VII.1920 (3,UASM). Elkwater, 15.VI.1955 (1,UASM). Exshaw, 01.VII.1959 (2,JCarr). Fort McMurray, 23.VI.1953 (1,CNC). George Lake, 01.VII.1973 (many, JBel). Ghost Dam, 31.V.1972 (1,JCarr). Slave Lake, 4mi. n; beach drift- Lesser Slave Lake; 07.VI.1975 (1,JBel). Tp. 21, Rge. 25, W5 Mer., 27.VI.1964 (1,JCarr). Tp. 28, Rge. 5, W5 Mer., 10.VI.1972 (1,JCarr). Tp. 29, Rge. 5, W5 Mer., 24.IX.1961 (6,JCarr). Tp. 38, Rge. 6, W5 Mer., 16.IX.1972 (2,JCarr). Sundre, 29.VI.1960 (2,JCarr). Wabamun, 02.VII.1917 (1,UASM).

BRITISH COLUMBIA:

Copper Mountain, 20.X.1930 (1,UBC). Summerland, 26.IX.1932 (15,CNC).

NORTHWEST TERRITORIES:

Fort Smith, 14.VI.1950 (1,CNC). Norman Wells, 11.VI.1949 (1,CNC). Yellowknife, 20.V.1958 (1,CNC).

SASKATCHEWAN:

Cypress Hills, 08.IX.1967 (1,PMRS). Greenbush, 19.VI.1975 (1,PMRS). Tulabi, 02.VII.1970 (2,PMRS).

YUKON:

Alaska Hwy. mi. 681; 21.VI.1958 (1,CNC). Dawson, 58mi. e. -Gravel Lake; 12.VIII.1962 (3,CNC). Hansen Lake, 9mi.sw. Keno; 17.VII.1968 (5,CNC). Swim Lakes, 62° 13'N, 133° W; 18.VI.1960 (4,CNC). Watson Lake, 17.VI.1948 (1,CNC).

3.17.1 *Anatis lecontei* Casey

ALBERTA:

Blairmore, 25.VIII.1957 (2,JBel). Calgary, 09.VIII.1962 (2,JCarr). Claresholm, 20mi. sw., 10.VII.1956 (1,NFRC). Coleman, 07.IX.1950 (1,NFRC). Ghost Dam, 20.VI.1973 (8,JCarr). Lethbridge, 23.VII.1923 (1,UASM). Maycroft, 23.VII.1962 (5,NFRC). Tp. 24, Rge. 8, W5 Mer., 23.VI.1973 (1,JCarr).

3.17.2 *Anatis rathvoni* (LeConte)

ALBERTA:

Waterton, 10.VIII.1952 (1,UASM).

BRITISH COLUMBIA:

Duncan, Sanca, 07.X.1944 (2,UBC). Summerland, 14.VII.1942 (1,UBC). Vancouver, 25.II.1926 (1,UBC). Wynndel, 19.V.1946 (2,UBC).

3.17.3 *Anatis borealis*, new species

ALBERTA:

Alberta boundary, 60° N, 1927 (1,UASM). Calgary, 06.V.1973 (2,JCarr). Cypress Hills, 25.V.1925 (1,UASM). Bezanson, 25.V.1961 (1,NFRC). Big Horn, 28.V.1951 (1,NFRC). Edmonton, 25.VII. 1971 (1,JBel). Ghost Dam, 30.V.1973 (4,JCarr). Hillcrest, 24.VII.1962 (1,NFRC). Kananaskis, 09.VI.1969 (1,UCKC). Nordegg, 02.VII.1948 (3,NFRC). Peace River, 16.VIII.1956 (2,NFRC). St. Vincent, 24.VII.1964 (2,NFRC). Sundre, 24.VII.1948 (3,NFRC). Tp. 21, Rge. 4, W5 Mer., 04.X.1970 (1,JCarr). Tp. 28, Rge. 5, W5 Mer., 10.VI.1972 (1,JCarr). Waterton, 01.VIII.1932 (5,UASM). Whitecourt, 20mi.w. Windfall Gas Plant., 04.IX.1975 (1,JBel).

BRITISH COLUMBIA:

Creston, IX.1937 (1,UBC). Fraser Valley, (1,CAS). Rock Creek, 26.VIII.1943 (1,UBC). Vernon, 08..V.1946 (1,UBC).

MANITOBA:

Carberry, 21.VII.1967 (2,NFRC). Clear Lake, 24.VII.1957 (1,NFRC), on *Larix laricina*. Chief's Bay, 09.VIII.1943 (1,NFRC), on *Picea* sp. Indian Head, 31.V.1936 (2,NFRC), fed on *Psyllia negundis*. Moon Lake, 15.VII.1957 (2,NFRC). Seddons Corner, 25.VIII.1951 (1,NFRC) on *Pinus* sp. Vassar, 06.VII.1951 (1,NFRC) on *Larix* sp., West Hawk Lake, 25.VIII.1951 (1,NFRC) on *Salix* sp.,

NORTHWEST TERRITORIES:

Fort Liard, 19.VII.1963 (1,NFRC). Fort Providence, 14.VII.1965 (1,NFRC). Fort Smith, 20mi. W., 18.VI.1965 (1,NFRC). Fort Wrigley, 05.IX.1932 (1,JBel).

SASKATCHEWAN:

Cypress Hills, 07.IX.1967 (2,PMRS). Kandahar, 05.VII.1968 (2,PMRS). Bennie, 29.VII.1959 (2,NFRC). Somme, 06.V.1964 (1,PMRS).

YUKON:

Mayo, 05.VII.1955 (1,JCarr).

3.18.1 *Myzia subvittata* (Mulsant)

ALBERTA:

Banff, 23.VI.1922 (1,CAS). Waterton, 17.VII.1931 (5,UASM).

BRITISH COLUMBIA:

Creston, 23.VII.1959 (1,UBC). Duncan, no other data; (1,UASM). Edgewood, 10.VIII.1943 (1,UBC). Golden, 18.VIII.1943 (1,UBC). Kootenay Landing, 11.V.1950 (1,UBC). Lillooet, 10.VII.1950 (1,UBC). Nanaimo, 28.VI.1918 (1,CAS). Pender Harbor, Hotel Lake; 18V.1926 (1,CAS). Seymour Creek, 08.VI.1930 (1,CAS). Vancouver, 13.VII.1960 (1,UBC). Victoria, 22.V.1921 (1,UBC). Wynndel, 12.V.1946 (1,UBC).

3.18.2 *Myzia horni* Crotch

ALBERTA:

Medicine Hat, 01.VI.1929 (1,UASM).

BRITISH COLUMBIA:

Barriere, 15.VIII.1949 (1,UBC). Cascade, 28.V.1957

(1,NFRC). Glenemma Range, 24.IV.1958 (2,UBC). Larkin, 27.VI.1949 (1,NFRC). Lilloet, 28.VII.1950 (1,UBC). McClure, 09.VI.1956 (1,NFRC). Oliver, 08.IX.1949 (1,NFRC). Otter Bay, 13.IV.1951 (1,JBel). Peachland, 11.VI.1949 (1,JBel). Squilax, 01.X.1949 (1,NFRC). Vernon, 12.VI.1918 (1,CAS); 11.V.1932 (1,CAS). Vinsulla, 28.VI.1952 (1,NFRC). Westbank, 12.VI.1951 (1,JBel).

3.18.3 *Myzia pullata* (Say)

ALBERTA:

Big Horn, 28.V.1951 (1,JBel). Ghost Dam, 28.V.1973 (4,JCarr).

BRITISH COLUMBIA:

Langford, 18.VII.1949 (1,UBC). Tweedsmuir Park, Michel Peak (7300 ft.); 02.VIII.1963 (1,UBC). Tweedsmuir Park, Wells Gray Peak (7100 ft.); 24.VIII.1963 (1,UBC).

NORTHWEST TERRITORIES:

Aklavik, 20.IX.1930 (1,CAS).

YUKON:

Alaska Hwy. mi. 627; 01.VII.1955 (2,JCarr). Mayo, 05.VII.1955 (3,JCarr).

SASKATCHEWAN:

Cypress Hills, IX.1967 (1,PMRS). Kandahar, 05.VII.1968 (1,PMRS). Maple Creek, 19.VI.1968 (1,JBel).

3.19.1 *Calvia* (*Anisocalvia*) *quatuordecimguttata* (L.)

ALASKA:

Big Delta, 04.VI.1951 (1,CNC). Cooper Landing, Kenai Peninsula, 07.VI.1951 (1,CNC). Fairbanks, 25.VII.1948 (1,UASM); 15.VIII.1948 (1,USNM). Matanuska, 18.V.1944 (1,USNM); 17.VI.1944 (1,USNM). Seward, VII. 1913 (1,CAS).

ALBERTA:

Banff, IV.-VI. (5,BNPC). Barrhead, 20mi. e., 30.VII.1965 (3,NFRC). Bighorn, 28.V.1951 (1,NFRC). Bilby, 17.V.1925 (2,CAS). Blairmore, 08.VII.1948 (2,NFRC). Cow Creek, 28.V.1951 (1,NFRC). Crowsnest Forest, Racehorse Creek; 18.VIII.1949 (1,NFRC). Dovecourt, 22.VII.1950 (1,NFRC). Dunvegan Ferry, 03.VIII.1958 (1,NFRC). Edmonton, 03.V.-02.VIII. (many,UASM). Fort Chipewyan, 03.VI.1903 (1,USNM). Fort McMurray, 22-26.VI.1953 (2,CNC). High Level, /no other data/; (1,MCZ). Horburg, 30.V.1957 (1,NFRC). Jasper, 27.VII.1967 (2,NFRC). Kananaskis, 12.V.-19.VI.-21.VIII.1968 (3,UCKC). Lundbreck, 21.VIII.1949 (1,NFRC). Maycroft, 11.VII.1948 (1,NFRC). Nose Creek, 40mi. sw. Wembley; 09.VIII.1951 (1,NFRC). Robb, 15.VI.1962 (1,UASM). Rocky Mt. House, 03.VI.1946 (1,NFRC). Seebe, 04.VIII.1967 (2,NFRC). Tofield, 22.V.1924 (1,CAS). Wabamun, 13.V.1933 (6,UASM). Wapiti Ferry, 30mi. sw; 26.VI.1956 (1,NFRC). Waterton Lakes Nat. Park, 27.VI.1948 (1,NFRC). Wimbley, 07.IX.1955 (5,NFRC).

BRITISH COLUMBIA:

Barlow Creek, 12.IX.1952 (1,UBC). Boulder Canyon, 21.VIII.1958 (1,UBC). Bowron Lake, 19.VIII.1958 (1,UBC). Cedervale, 11.IX.1946 (1,UBC). Chee Kye, 24.VIII.1929

(1,UBC). Cherryville, 20.VI.1949 (1,UBC). Copper Mountain, 08.VI.1929 (2,UBC). Cowichan Lake, 06.VII.1950 (1,UBC). Creston, VI.-VIII. (10,UBC). Crawford Bay, 12.IX.1957 (1,UBC). Duck Creek, nr. Wynndel, 13.VI.1960 (1,UASM). Fernie, 03.VIII.1934 (2,CAS). Gray Creek, 23.IX.1957 (1,UBC). Ground Birch Lake, 22.VII.1958 (1,UBC). Kersley, 09.VIII.1957 (1,UBC). Lardo, 21.VI.1958 (1,UBC). Lumberton, 18.VI.1960 (1,UBC). Muskwa, (21.VIII.1952 (1,UBC). Ness Lake, 04.VII.1958 (1,UBC). Saanich District, 30.V.1918 (1,NFRC). Sanca, 28.V.1933 (1,UBC). Simonette, 16.VIII.1961 (1,NFRC). Vancouver, 31.V.1931 (1,UBC). Yoho River, Yoho National Park; 29.VI.1949 (1,NFRC). Victoria, Dallas Road; 18.VII.1924 (1,CAS).

IDAHO:

Samuels, 01.V.1936 (4,CAS).

MICHIGAN:

Copper Harbor, 20.VIII.1951 (1,CAS). Marquette, /no other data/, (1,CAS).

NORTHWEST TERRITORIES:

Aklavik, 22.VI.1956 (1,CNC); 16.VI.1956 (3,CNC); 15.VIII.1932 (1,CAS). Fort Smith, 10.VI.1950 (1,CNC). Fort Wrigley, 30.VII.1962 (1,NFRC). Reindeer Depot, 04.VIII.1948 (17,CNC). Saw Mill Bay, 21.VI.1948 (1,CNC). Tanunuk, 10.VIII.1930 (1,CAS).

SASKATCHEWAN:

Fort Qu'Appelle, 14.V.1973 (1,PMRS); 15.VII.1966 (1,PMRS); 16.IX.1967 (1,PMRS). Greenbush, 18.VI.1975

(1,PMRS). Kandabar, 14.VIII.1968 (3,PMRS).

YUKON:

Dawson, 17.VI.1949 (2,CNC). Mayo, 05.VII.1955 (2,JCarr). Otter Lake, 28.VII.1960 (1,CNC). Rampart House, 24.V.1951 (5,CNC). 60 Mi. Road, mi. 35; 10.VII.1949 (1,CNC).

3.20.1 Adalia bipunctata (L.)

ALASKA:

College, 29.V.1966 (1,JBel).

ALBERTA:

Calgary, V.-X.1967 (many, JCarr, UASM). Edmonton, II.-X. 1917-1974 (many, JBel, UASM). Gorge Creek, 19.VII. 1958 (8,UASM). Golden Spike, 10.VII.1957 (7,UASM). Grande Prairie, 13.VI.1972 (1,UJBel). Gull Lake, 04.VI.1929 (2,UASM). Hussar, 12.IX.1959 (1,JCarr). Jumningpound Creek, 11.VI.1961 (1,JCarr). Kananaskis, 13.VI.1968 (2,UCKC). Lacombe, Gull Lake; VI.1901 (1,UASM). Leduc, 08.V.1914 (1,UASM). Lesser Slave Lake, e. end; (1,UASM). Lundbreck, 26.VII.1926 (1,UASM). Medicine Hat, IV.-X. 11923 (many, UASM). Pincher Creek, 12.VII.1930 (1,UASM). Slave Lake, 4mi. n; beach drift- Lesser Slave Lake; 07.VI.1975 (12,JBel). Tp. 7. Rge. 2, W5 Mer., 01.VII.1961 (1,JCarr). Tp. 22, Rge. 1, W4 Mer., 05.VIII.1972 (1.JCarr). Tp. 31. Rge. 5, W5 Mer., 29.IV.1961 (1,JCarr). Wayhorn, 17.V.1901 (1,UASM). Waterton, 10.VIII.1932 (many, UASM).

BRITISH COLUMBIA:

Agassiz, 16.VII.1938 (1,UBC). Copper Mountain, 21.VII.1930 (1,UBC). Creston, V.-IX.1947 (many, UBC). Golden, 10.VII.1929 (1,UBC). Haney, 16.X.1959 (3,UBC). Kamloops, 27.VII.1939 (1,UBC). Kimberly, 13.VII.1957 (1,UBC). Kootenay Landing, 03.VI.1950 (1,UBC). Liard River, AH mi. 491; 20.VI.1958 (1,UASM). Lulu Island, 10.VI.1960 (3,UBC). Oliver, 23.IV.1952 (5,UASM). Parksville, 05.VII.1962 (1,JCarr). Sanca, 15.VI.1933 (1,UBC). Salmon Arms, 12.V.1933 (1,UBC). Trail, 14.V.1909 (1,UASM). Vaz, 23.V.1960 (5,UBC). Vancouver, I.-X. (many,UBC). Vernon, 26.VI.1929 (3,UBC). Victoria, 09.IX.1954 (1,UBC). Wynndel, 19.V.1946 (1,UBC).

OREGON:

Bar View State Park, Tilla Co., 04.IV.1973 (2,WSUP).

WASHINGTON:

Almota, Whitman Co., 27.IV.1972 (2,WSUP). Fort Canby State Park, Pacific Co., 11-13.VI.1971 (1,WSUP). Pullman, Whitman Co., 11.II.1973 (1,WSUP); 19.II.1973 (2,WSUP); 18.V.1966 (1,WSUP). Richland, Benton Co., 10.VII.1967 (2,WSUP).

YUKON:

Mayo, 05.VII.1955 (4,JCarr).

3.21.1 _Olla_ _v-nigrum_ Mulsant

BRITISH COLUMBIA:

Summerland, 21.VII.1972 (1,CDAS).

3.22.1 *Cycloneda polita* Casey

ALBERTA:

Aden, 20.VII.1960 (2,JCarr). Edmonton, 28.VII.1916 (1,UASM). Fort MacLeod, 26.VII.1963 (3,JCarr). Medicine Hat, 07.X.1967 (1,JCarr).

BRITISH COLUMBIA:

Belcarra, 10.IX.1939 (1,UBC). Campbell River, 17.VII.1961 (1,UBC). Creston, 09.VI.1946 (1,UBC). Denman Island, 18.VII.1961 (3,UBC). Golden Pars, 22.VI.1963 (3,UBC). Harrison Hot Springs, 28.VII.1963 (1,UBC). Kaslo, 10.IV.1904 (1,UASM). Keremeos, 3mi. w; 12.V.1934 (1,UBC). Lytton, 27.V.1962 (1,UBC). Meyer's Flat, nr. Oliver; 02.V.1957 (1,CDAS). Okanagan Centre, 29.IV.1957 (2,CDAS). Oliver, 23.IV.1952 (3,CDAS). Penticton, 23.IX.1927 (2,UBC). Quadra Island, 17.VII.1961 (1,UBC). Sooke, 15.VII.1961 (1,UBC). Summerland, 19.IX.1957 (1,JCarr). Storms, 06.VII.1962 (1,JCarr). Vancouver, 06.VIII.1960 (6,UBC); 13.V.1963 (2,UBC). Vaseux Lake, 02.IX.1970 (1,CDAS). Vernon, 12.VI.1920 (1,UBC). Victoria, 09.VI.1962 (1,JCarr). Wardner, 11.VII.1929 (1,UASM). White Rock, 29.VI.1962 (1,JCarr).

……

3.23.1 *Coccinella alta* Brown

ALBERTA:

Banff, VI.1947 (2,BNPC). Flat Creek, 08.VIII.1942 (1,UASM). Miette Hot Springs, 13.VII.1973 (1,JBel). Tp. 21, Rge. 9, W5 Mer., 23.VI.1973 (1,JCarr). Tp. 36, Rge. 14, W5

Mer., 15.VII.1973 (1,JCarr).

MONTANA:

Flint Creek Mnts., Racetrack Peak (9,300 ft): 29-39.VI.1961 (2,UCB).

3.23.2 Coccinella monticola Mulsant

ALBERTA:

Bassano Dam, 10.VI.1970 (3,JBel). Clearwater, 29.VII.1948 (1,NFRC). Grovedale, 33mi. se., 07.VIII.1962 (1,NFRC). Hando, 24.VI.1969 (12,NFRC). MacLeod, 28.VIII.1924 (2,UASM). Medicine Hat, 16-29.VII.1928 (3,UASM). Pincher Creek, 25.V.1928 (3,UASM). South Fork River, 24.V.1928 (1,UASM). Valleyview, 48mi. sw., 07.VIII.1964 (3,NFRC). Wapiti, 29.VII.1960 (1,NFRC).

BRITISH COLUMBIA:

Alaska Hwy. mi. 417.8, Racing River Campground; 10.VIII.1972 (1,JBel). Creston, 03.VIII.1947 (1,UBC). Radium, 04.VI.1953 (3,JCarr). Royal Oak, Vancouver I., 18.VI.1953 (1,UBC). Victoria, 02.VI.1949 (2,UBC); 07.VII.191962 (7,JCarr). Windermere Road, mi. 105 from Golden; 14.V.1932 (1,UBC).

MANITOBA:

Waterhen River, 05.VIII.1966 "on Picea glauca" (1,NFRC).

NORTHWEST TERRITORIES:

Artillery Lake, 08.VII.1924 (1,UASM). Fort McPherson, (1,CNC). Fort Smith, (1,CNC).

SASKATCHEWAN:

Waskesieu, 10.VI.1938 (1,PMRS).

YUKON:

Alaska Hwy. mi. 710, 10.VII.1955 (1,JCarr).

3.23.3 Coccinella transversoguttata Mulsant

ALBERTA:

Banff, 04.VI.1961 (1,UASM). Bassano Dam, 10.VI.1970 (5,JBel). Beaverlodge, 21.VI.1931 (1,UASM). Blairmore, 30.VI.1957 (2,UASM). Brooks, 22.VI.1971 (7,CDAL). Calahoo, 24.V.1968 (1,UASM). Calgary, 19.IV.1953 (8,JCarr). Crowsnest, 30.VI.1957 (9,UASM). Cypress Hills, 03.VII.1971 (1,JBel). Duchess, 19.VI.1971 (4,CDAL). Edmonton, 25.VI.1958 (11,UASM). Ellerslie nr. Edmonton, 10.V.1970 (15,JBel). Fort Chipewyan, 13.VI.1970 (2,JBel). George Lake, 01.VII.1973 (many, JBel). Ghost Dam, 28.III.1953 (1,JCarr). Gorge Creek, 22.VI.1958 (10,UASM). Gull Lake, 04.VI.1929 (3,UASM). Half Moon Lake, 01.VIII.1971 (2,JBel). Jasper National Park, Jasper Lake; 13.VII.1973 (1,JBel). Lethbridge, 22.V.1957 (7,UASM). MacLeod, 28.VIII.1924 (1,UASM). Manyberries, 08.VIII.1949 (1,UASM). Onefour, 01.V.1956 (1,UASM). Scandia, 26.VI.1956 (1,UASM). Slave Lake, 4mi. n; beach drift- Lesser Slave Lake; 07.VI.1975 (many, JBel). Red Deer, 07.VIII.1966 (2,UASM). Robb, 40mi. w., Prospect Creek; 10.VI.1971 (1,JBel). Tawatinaw, 20.IX.1956 (2,UASM). Tofield, 11.V.1924 (1,UASM). Wabamun, 08.IX.1955 (8,UASM). Wapiti River, nr. Grande Prairie;

28.V.1970 (2,JBel).

BRITISH COLUMBIA:

Alaska Hwy. mi. 417.8, Racing River Campground; 10.VIII.1972 (25,JBel). Kamloops, 15.VIII.1954 (1,UBC). Meyer's Flat, 13.V.1953 (3,UCDAS). Mount Robson Provincial Park, campground; 15.VII.1973 (9,JBel). New Hazelton, 12.VII.1972 (1,JBel). Oliver, 23.IV.1952 (3,CDAS). Penticton, 06.VIII.191970 (5,CDAS). Qualicum, V.I., VIII.1965 (1,UBC). Riske Creek, 07.VI.1931 (1,UBC). Summerland, 24.VI.1970 (3,CDAS). Topley, 18.VIII.1973 (1,Jbel). Vancouver, VII.1965 (1,UBC). Yoho National Park, 2mi.s. Takakkaw Falls /4,900 ft/, 05.X.1963 (1,UASM).

NORTHWEST TERRITORIES:

Fort Providence, 06.VI.1966 (1,JBel). Hart Lake, 60° 51'N, 116° 37'W; 17.VI.1973 (4,JBel). Yellowknife, VI.-VII.1973 (many,JBel).

OREGON:

Almota, Whitman Co., 27.IV.1972 (1,WSUP). Asotin Co., 3mi. nw. Asotin, 16.VI.1972 (1,WSUP). Benton Co., Richland, 13.VI.1967 (1,WSUP). Grant Co., Soda Lake, nr. O'Sullivan Dam, Columbia National Wildlife Refuge, 10.VI.1973 (3,WSUP).

YUKON:

Mayo, 03.VII.1955 (1,JCarr).

3.23.4 Coccinella hieroglyphica (L.)

ALBERTA:

Boyle, 26.VII.1949 (1,NFRC). Calgary, 23.V.1963 (3,JCarr). Carrot Creek, 01.VIII.1959 (1,NFRC). Cypress Hills, 02.VI.1956 (1,JCarr); 10.VIII.1929 (1,UASM). Edmonton, 13.X.1917 (1,UASM). Fort Vermillion, 06.VI.1956 (1,NFRC). Ghost Dam, 25.VI.1964 (2,JCarr). Grovedale, 22.V.1963 (2,NFRC). Gull Lake, 04.VI.1929 (2,UASM). Hinton, 07.VII.1966 (1,NFRC). Leduc, 06.V.1914 (1,UASM). Mundarte, 27.V.1965 (1,NFRC). Nordegg, 29.VII.1948 (2,NFRC). Okotoks, 06.VIII.1963 (1,NFRC). Pincher Creek, 06.VIII.1925 (2,UASM). Rocky Mt. House, 18.V.1965 (1,NFRC). Slave Lake, 4mi. n; beach drift- Lesser Slave Lake; 07.VI.1975 (12,JBel). Sundre, 15mi. sw., 10.VIII.1956 (2,NFRC). Teepee Creek, 22.VI.1966 (1,NFRC). Two Creeks, 22.VI.1960 (3,NFRC). Kootenay Crossing, 05.VI.1951 (1,NFRC).

BRITISH COLUMBIA:

Courtenay, 03.V.1932 (3,UASM). Phillips Creek, Clearwater Valley; 29.VII.1928 (1,NFRC). Shaswah Indian Reserve, 09.VII.1926 (2,UASM).

NORTHWEST TERRITORIES:

Anderson River, delta; 1.-24.VI.1963 (1,UASM).

SASKATCHEWAN:

Kandahar, 05.VII.1968 (1,PMRS). Narrows Road, 30.V.1958 "on *Populus tremuloides*" (2,NFRC). Prince Albert, 23.VI.1958 "*on Salix sp.*," (1,NFRC). Punnichy, VII.1969 (1,PMRS).

YUKON:

3.23.5 *Coccinella novemnotata* Herbst

ALBERTA:

Bassano Dam, 10.VI.1970 (4,JBel). Brooks, 09.VI.1971 (2,CDA). Burmis, 07.VI.1967 (1,NFRC). Calgary, 14.VI.1953 (1,JCarr). Canmore, 303.IV.1953 (1,JCarr). Chin, 06.VII.1957 (1,UASM). Edmonton, 18.VI.1919 (1,UASM); 11.VIII.1915 (1,UASM). Gorge Creek, 22.VII.1958 (1,UASM). Grainger, 20.IV.1922 (1,UASM). Gull Lake, 04.VI.1929 (2,UASM). Kananaskis, 01.VIII.1948 (1,NFRC). Lethbridge, V.-VII. (many, UASM, CDAL). Manyberries, 26.V.1938 (1,UASM). Medicine Hat, II.-VII. (many, UASM). Nobleford, 13.VI.1967 (1,NFRC). Seebe, 09.VII.1956 (1,NFRC). Tp. 5, Rge. 7, W4 Mer., 13.VII.1973 (1,JCarr). Tp. 14, Rge. 3, W4 Mer., 13.VI.1963 (1,JCarr). Waiparous, 04.VII.1954 (1,JCarr).

BRITISH COLUMBIA:

Cranbrook, 11.VII.1924 (1,UASM). Cummings Lake, 06.VI.1960 (1,UBC). Oliver, 30.VII.1956 (1,JCarr). Osoyoos, 12.VII.1962 (1,JCarr). Radium, 06.VI.1953 (9,JCarr). Sumas, 03.VI.1933 (1,NFRC). Summerland, 15.IX.1957 (12,UBC). Vancouver, 30.V.1971 (1,JBel); 14.IX.1927 (1,NFRC). Vernon, 19.V.1948 (1,NFRC). Victoria, 07.VII.1962 (1,JCarr). Trinity Valley, 12.VI.1929 (1,NFRC). Williams Lake, 28.VII.1967 (1,UBC).

3.23.6 *Coccinella fulgida* Watson

ALASKA:

Mead River, s. Point Barrow; (1,CNC). Toms Lake, Alaska Peninsula; (1,CNC).

NORTHWEST TERRITORIES:

Anderson River, delta islands; 19.VI.1961 (13,UASM). Bathurst Inlet, 66° 50'N, 108° 02'W; 11.VI.1951 (4,CNC). Kater Point, 67° 42'N, 109° 03'W; 24.VIII.1951 (1,CNC). Langton Bay, 69° 22'N, 125° 11'W; summer 1911 (1,CNC).

YUKON:

Old Rampart House, 60-70mi. n., 68° 10'N, 142° W; (1,CNC). Rampart House, 67° 42'N, 109° 03'W; (1,CNC). Reindeer Depot, 68° 42'N, 134° 03'W; 28.VI.1948 (1,CNC).

3.23.7 Coccinella undecimpunctata L.

BRITISH COLUMBIA:

Vancouver, English Bay; 30.V.1972 (2,JBel).

WASHINGTON:

Port Townsend, Jeff Co., 16.VI.1971 (7,WSUP).

3.23.8 Coccinella californica Mannerheim

ALBERTA:

Calgary, 29.VI.1959 (1,JBel).

BRITISH COLUMBIA:

Belcara, 10.X.1937 (1,UASM). Capilano, 30.VI.1962 (1,JCarr). Golden Ears, 12.VI.1960 (2,UBC). Haney, Loon Lake; 16.X.1961 (2,UBC). Lulu Island, 10.VI.1960 (2,UBC). Mandarte Island, 12.VI.1960 (12,UBC). Nanaimo, 22.VI.1925 (1,UBC). Osoyoos, 25.V.1969 (1,UBC). Saanichton, 01.VIII.1955 (1,UASM). Tsawwassen Beach, 23.VII.1961 (1,UBC). Vancouver, V.-X. (many, UBC, JBel, UASM). Victoria, 07.VII.1962 (3,JCarr).

CALIFORNIA:

Point Joe, beach; 22.III.1974 (3,JBel). Point Lobos, 04.VIII.1969 (3,JBel).

WASHINGTON:

Jeff Co., Fort Worden, nr. Port Townsend, 15.VI.1971 (20,WSUP).

3.23.9 *Coccinella trifasciata* L.

ALASKA:

Matanuska, 17.V.1945 (3,CNC). Unalakleet, 08.VI.1961 (12,CNC).

ALBERTA:

Beaverlodge, 14.VI.1931 (2,UASM). Big Horn, 26.V.1951 (2,NFRC). Blairmore, 30.VIII.1957 (2,UASM). Calgary, 04.VII.1953 (4,JCarr). Caroline, 17.VIII.1945 (1,NFRC). Cooking Lake, 18.VII.1937 (1,UASM). Cypress Hills, 20.VII.1956 (12,UASM). Dilberry Lake, 52° 34' 30''N, 110° 00' 45''W; 05.VI.1960 (1,UASM). Drayton Valley, 20mi. sw., 11.VI.1957 (2,NFRC). Edmonton, 12.VIII.1933 (1,UASM); 30.IX.1972 (1,UASM); 15.V.1972 (3,JBel). Elkwater, 25.V.1952 (1,CNC); 22.VII.1951 (1,NFRC). Edson, 21.VIII.1963 (1,CNC). Fort McMurray, 21.VI.1953 (1,CNC). Frank, 19.VIII.1934 (1,CNC). George Lake, 01.VII.1973 (many, JBel). Golden Spike, 11.VII.1957 (1,UASM). Gorge Creek, 09.VIII.1958 (2,UASM). Gull Lake, 04.VI.1929 (4,UASM) Happy Valley, 22.V. 1926 (1,UASM). Huallen, 24.VI.1940 (1,CNC). Leduc, 03.V.1914 (1,UASM). Lethbridge, 05.VIII.1930 (1,CNC). Lunbreck, 08.VIII.1925 (1,UASM). Medicine Hat, V.-VIII. (many,UASM,CDAL,JBel). McLennan, 03.V.1965 (1,NFRC). Peace River, 01.VI.1969 (1,NFRC). Pincher Creek, 24.VI.1928 (1,UASM). Provost, 13.VI.1959 (1,UASM). Red Deer, 01.IX.1915 (1,CNC). Slave Lake, 9mi. nnw., 05.VI.1971 (1,UASM). Sturgeon Lake, 03.VII.1940 (1,CNC). Sundre, 29.VII.1948 (2,NFRC). Wabamun, 04.VIII.1936 (1,UASM). Waterton, 10.VII.1930 (3,UASM). Waiparous, 30.VI.1960 (2,JCarr). Whitecourt, 27.V.1970 (1,UASM).

BRITISH COLUMBIA:

Agassiz, 05.V.1951 (8,CNC). Aspen Grove, 14.VI.1963 (1,UBC). Atlin, 07.VI.1955 (1,CNC); 13.VI.1955 (1,CNC). Denman Island, 18.VII.1961 (1,UBC). Douglas, 22.VI.1958 (1,CNC). Endiver, 11.VI.1961 (1,UBC). Harris Creek, 15.VII.191961 (3,UBC). Hope, 12mi. e., 02.VI.1968 (1,CNC). Huntigton, 30.VI.1953 (1,CNC). Kamloops, 26.VIII.1954 (1,UBC). Kitimat River, 24mi. s. Terrace; 19.VII.1960 (1,CNC). Lake Errock, nr. Deroche; 02.VI.1953 (2,CNC). Liard River Hot Springs, 24.VIII.1962 (2,CNC). Lytton, 18mi. n., 12.VI.1963 (1,UBC). Mac Gilliwray Creek, nr. Chiliwack; 28.VII.1953 (1,CNC). Manning Provincial Park, 26.VIII.1961 (1,UBC). Merritt, 05.VI.1948 (1,CNC); 15.VIII.1948 (1,UBC). Midday Valley, 30.VI.1925 (1,UBC). Milner, 12.VII.1953 (1,CNC). Mission City, 09.VII.1953 (1,CNC). New Hazelton, 12.VII.1972 (2,JBel). Nicola, 07.VIII.1932 (1,UBC). North Pine, 24.V.1944 (1,UBC). Pitt Meadows, 21.VI.1953 (30,CNC). Quadra Island, 17.VII.1961 (2,UBC). Quesnel Forks, 29.V.1962 (3,UBC). Robson, 22.V.1948 (30,CNC). Royal Oak, 01.XI.1917 (2,CNC). Saanich, 28.IV.1930 (4,CNC). Saturno Island, 06.V.1957 (1,UBC). Sidney, 13.V.1927 (25,CNC). Sooke, 15.VII.1961 (1,UBC). Spring House, Cariboo; 04.VII.1962 (1,UBC). Summerland, 26.V.1932 (8,CNC). Summit Lake, 01.VII.1959 (4,CNC).

Terrace, 27.VIII.1960 (2,CNC). Trinity Valley, 25.VIII.1929 (1,CNC). Vancouver, 30.V.1972 (19,JBel); 15.IV.1962 (1,CNC); III.-XI. (many,UBC). Vernon, 03.V.1929 (1,UBC). Victoria, 17.IV.1919 (1,CNC). Wardner, 11.VII.1929 (1,UASM). Westwick Lake, 15.VII.1962 (1,UBC).

MANITOBA:

Prawda, 24.VIII.1959 "on *Populus tremuloides*" (1,NFRC).

NORTHWEST TERRITORIES:

Fort Norman, 06.VII.1922 (1,CNC). Fort Simpson, 22.VI.1922 (1,CNC). Fort Smith, 08.VI.1950 (8,CNC). Hay River, 16.VI.1951 (1,CNC). Kakisa River, 21.VI.1973 (1,JBel). Yellowknife, 29.V.1953 (1,CNC).

OREGON:

Wallowa Co., Minam State Park, 09.VI.1971 (1,WSUP). Wallowa Co., Wallowa State Park, 08-09.VI.1971 (1,WSUP).

SASKATCHEWAN:

Cypress Hills, 30.V.1973 (1,PMRS). Fort Qu'Appelle, 30.VI.1966 (1,PMRS). Kandahar, 29.V.1972 (1,PMRS). Red Earth, VIII.1969 (1,PMRS). Somme, 1962 (1,PMRS).

WASHINGTON:

Asotin Co., Fields' Spring State Park, 4mi.s. Anatone, 3500-4000 ft., 07.VI.1973 (1,WSUP); 14.VI. 1972 (2,WSUP). Jeff Co., Fort Worden, nr. Port Townsend, 15.VI.1971 (6,WSUP). Mount Vernon, 07.V.1957 (1,WSUP). Pacific Co., 8mi.sw. Tieton RS, Snoquamie NF, Bear Creek, 11-12.VI.1973 (5,WSUP).

YUKON:

Dawson, 17.VI.1949 (1,CNC). Gravel Lake, 58mi. e. Dawson; 13.VIII.1962 (1,CNC). La Force Lake, 62° 41' N, 132° 20'W; 17.VI.1960 (1,CNC). Norman Wells, 16.VI.1949 (1,CNC). North Fork Pass, Ogilvie Mts., 17.VI.1962 (1,CNC). Snag, 24.VII.1948 (1,CNC). Swim Lakes, 62° 13' N, 130° W; 13.VI.1960 (2,CNC). 60° 00' 15'' N, 112° 05' 27'' W; 14.VI.1953 (1,CNC).

3.23.10 *Coccinella prolongata* Crotch

ALBERTA:

Waterton, 08.VII.1972 (1,JBel).

BRITISH COLUMBIA:

Oliver, 30.VII.1956 (1,JCarr). Princeton, 04.VIII.1956 (1,JCarr).

MONTANA:

Rosebud Lake, e., Carbon Co; 15.VI.1961 (1,JBel).

3.24.1 *Hippodamia arctica* (Schneider)

ALASKA:

Deering, Seward Peninsula, 20-23.VII.1968 (1,JBel). Umiat, 19.VI.1954 (2,CNC).

BRITISH COLUMBIA:

Summit Lake, AH mi. 392; 15.VI.1959 (2,CNC).

NORTHWEST TERRITORIES:

Anderson River, delta; V.VI.1961 (1,JBel). Atkinson Point, 69°57'N, 131°30'W ; 20.VII.1972 (1,JBel).

3.24.2 *Hippodamia americana* Crotch

ALBERTA:

Rte. 2, 9.1mi. w. Athabasca River; 07.VII.1973 (1,UASM). Slave Lake, 4mi. n; beach drift- Lesser Slave Lake; 07.VI.1975 (2,JBel). Tp. 29, Rge. 5, W5 Mer., 25.VIII.1972 (1,JCarr). Tp. 37, Rge. 5, W5 Mer., 02.IX.1973 (26,JCarr). Tp. 38, Rge. 6, W5 Mer., 16.IX. 1972 (2,JCarr).

SASKATCHEWAN:

Kandahar, 05.VII.1968 (1,PMRS). Waskesieu, 05.VII.1938 (1,PMRS).

3.24.3 *Hippodamia caseyi* Johnson

ALBERTA:

Brooks, 06.VIII.1921 (1,UASM). 16.X.1970 'alfaalfa' (1,JBel; 1,CDAL). Crowsnest Pass, 12.VII.1972 (1,JBel). Cypress Hills, 20.VII.1929 (1,UASM); 03.VIII.1931 (1,UASM). Edmonton, 10.VII.1917 (8,UASM). Medicine Hat, 07.V.1928 (1,UASM); 04.VII.1931 (1,UASM); 07.VII.1931 (1,UASM). Porcupine Hills, 20mi. w. Claresholm; "aggregation under rock" 16.IX.1975 (10,CDAL). Waterton, 17.VII.1931 (3,UASM); 10.VII.1930 (1,UASM).

BRITISH COLUMBIA:

Bridesville, 01.VIII.1970 (3,CDAS). Copper Mountain, 24.VIII.1948 (1,CNC). Cranbrook, 11.V.1929 (1,UASM). Fernie, 26.VIII.1934 (1,UBC). Lytton, 09.VIII.1931 (1,UBC). Manning Park, 27.VIII.1961 (3,UBC). Midday Valey, nr. Merritt; 15.VI.1924 (1,UBC). Mount Baldy, 7500 ft;

03.VIII.1970 (35,CDAS). Mount Kobau, 05.VIII.1970 (2,CDAS). Nehalliston Forest, Poison Butte; 02.IX.1928 (1,UBC). Okanagan Lake, 14.VII.1935 (1,UBC). Penticton, 06.VIII.1970 (4,CDAS). Summerland, 30.VIII.1937 (1,UBC); 01.V.1956 (1,UBC). Vernon, 27.VII.1920 (2,UBC).

IDAHO:

Cedar Mountain, 09.VII.1920 (1,UBC). Clarkia, 7mi. ne. Shoshone Co., 21.VII.1973 (1,WSUP). Moscow Mountain, rest-stop, Hwy. 95., Latah Co., 01.II.1973 (1,WSUP).

WASHINGTON:

Church Mountain, 4000 ft; 18.V.1930 (2,UBC). Mount Mixup, Cascade Pass; 19.VIII.1961 (1,UBC). Mount Sahale, Cascade Pass - 6000 ft; 31.VII.1960 (1,UBC). Richland, Benton Co., 10.VII.1968 (1,JBel; 1,WSUP). Squillchuck State Park, 9mi. se. Wenatchee, Chelan Co., 17.VI.1973 (4,WSUP).

3.24.4 *Hippodamia convergens* Guerin-Meneville

ALBERTA:

Brooks, Lake Newell, 08.VI.1960 (1,UASM). Calgary, 17.VI.1959 (1,JCarr). Cypress Hills, 29.VII.1930 (2,UASM). Ghost Dam, 12.VII.1953 (1,JCarr). Gorge Creek, 27.VII.1958 (1,UASM). Manyberries, 08.VIII.1949 (1,UASM). Medicine Hat, I.-XI. (many, UASM). Red Deer, 13.VIII.1966 (1,JBel). Tp. 14, Rge. 3, W4 Mer., 11.XI.1962 (1,JCarr).

ARIZONA:

Santa Catalina Mountains, Bear Wallow, Pima Co., 18.VII.1969 (30,UASM).

BRITISH COLUMBIA:

Bridesville, 01.VIII.1970 (1,CDAS). Keremeos, 3mi. w; 26.VII.1957 (1,CDAS); 29.V.1972 (5,JBel). Kootenay Landing, 29.VII.1956 (1,JCarr). Manning Provincial Park, 27.VIII.1961 (2,UBC). Meyer's Flat, 13.V.1953 (3,CDAS). Penticton, 27.VI.1962 (1,UBC); 29.V.1972 (27,JBel). Princeton, 11.VIII.1970 (2,CDAS). Summerland, 19.VIII.1957 (1,UASM).

CALIFORNIA:

Girard Reserve, 2mi. sw. Los Angeles Co., 19.III.1971 (1,WSUP). Joshua Tree National Park, 16.IV.1967 (1,JCarr). Mecca, 17.IV.1967 (1,JCarr). Nacimiento, 13.VIII.1969 (3,UASM). Palm Desert, 15.IV.1967 (1,JCarr). Point Joe, beach; 22.III.1974 (25,JBel). Redding, IV.1966 (2,WSUP). Salt Creek, nr. Shasta Lake, 08.IV.1959 (1,WSUP). Westgard Pass, Inyo Co., 18.VI.1969 (1,WSUP).

COLORADO:

Colorado Springs, Carex marsh, 19.VI.1959 (35,UASM). Mount Evans, summit, elev. ca. 14,000 ft; 07.VIII.1973 (3,JBel).

IDAHO:

Laird Park, 3mi.se. Harvard, Latah Co., 01.V.1971 (2,WSUP). Moscow, 15.IV.1966 (1,WSUP); 5mi. n. 31.I.1960. (4,WSUP). Moscow, Robinson Lake, 11.IX.1950 (1,WSUP). White Bird, 15mi. w., Idaho Co., 01.IV.1973 (1,WSUP).

INDIANA:

Bloomington, I.-X. (many, JBel). Brook, 07.VI.1938

(2,JBel). Huron, 01.VIII.1934 (many, JBel). Loganspot, Cuss Co., 22.IV.1957 (1,JBel). Spencer, 09.V.1937 (5,JBel). Union City, 29.VI.1938 (1,JBel). Worthington, Greene Co., 15.V.1954 (1,JBel).

IOWA:

Ames, 05.VIII.1937 (1,WSUP).

MINNESOTA:

Lake Bembidji, nr. Bembidji; 10.IX.1956 (40,UASM).

MEXICO:

Campache Camp, 30.VI.1968 (1,WSUP). Hidalgo, El Chico National Park, 12.4km ne. El Chico, elev. 2880m; 25-26.VI.1975 (8,UASM). Nuevo Leon, 15km s. San Roberto, Rte. 57, 2050 m; 19.VI.1975 (2,UASM). Ojuelos, Jalisco; 16.IX.1946 (1,WSUP). Zacatlan, Huejucar; 21.II.1931 (3,JBel).

OHIO:

Columbus, 25.IV.1938 (1,WSUP). Rock Creek, Ashtabula Co., 05.VIII.1971 (1,WSUP).

OREGON:

Hood River, 18mi. s., 10.VI.1971 (2,WSUP).

SASKATCHEWAN:

Cypress Hills, 08.IX.1967 (1,PMRS). Greenbush, 19.VI.1975 (1,PMRS). Fort Qu'Appelle, VI.1968 (1,PMRS). Regina, X.1967 (1,PMRS).

UTAH:

La Sal, 27.VII.1970 (3,JCarr). Moab, 27.VII.1970 (3,JCarr). Panguitch, 13mi. s., 17.VI.1961 (12,UBC).

Virgin, 07.VIII.1966 (1,JCarr).

WASHINGTON:

Colton, 09.VI.1948 'virgin prairie' (12,WSUP). Fields' Spring State Park, 31.VII.1971 (5,WSUP). Kamiak Butte, Whitman Co., 20.V.1971 (1,WSUP). Mount Sahale, Cascade Pass, 6,000 ft; 31.VII.1960 (1,UBC). Moses Lake, 07.VIII.1956 (6,WSUP). O'Sullivan Dam, Grant Co., 15.VIII.1954 (10,WSUP). Pullman, 30.VIII.1949 'virgin prairie' (1,WSUP). Pullman, Whitman Co., 19.IV.1971 (1,WSUP); 30.IX.1950 (2,WSUP). Pullman, Smoot Hill, 11.VIII.1970 (10,WSUP). Richland, Benton Co., 12.VI.1969 (1,WSUP). Toppenish, sw., Yakima Co., 07-08.V.1969 (1,WSUP). Wenatchee, 5mi. ne. 08.V.1957 (1,WSUP).

3.24.5 *Hippodamia apicalis* Casey

ALBERTA:

Calgary, 14.VI.1953 (3,JCarr); 10.VI.1953 (1,JCarr). Edmonton, 27.VI.1928 (2,UASM). Gull Lake, 20.VI.1929 (1,UASM). Medicine Hat, V.-VII. (many,UASM,JBel). Pincher, 29.V.1928 (1,UASM). Tp. 14, Rge. 3, W4 Mer., 13.IV.1963 (1,JCarr). Waiparous, 04.VII.1954 (1,JCarr). Waterton, 10.VII.1930 (2,UASM).

BRITISH COLUMBIA:

Basque, 26.VIII.1932 (1,UBC). Kamloops, 25.VI.1960 (1,UBC); 23.VII.1939 (1,UBC). Lillooet, 23.VI.1956 (1,CNC). Lytton, 18mi. n., 12.VI.1963 (3,UBC). Merritt, 29.VI.1961 (3,UBC); 21.IX.1962 (2,UBC); 10.VII.1963 (1,UBC). Meyer's

Flat, nr. Oliver; 02.V.1957 (10,CDAS). Mount Kobau, 05.VIII.1970 (8,CDAS). Nicola, 21.IX.1962 (1,UBC). Pavilion, 30.VI.1961 (2,UBC). Princeton, 05.VIII.1956 (1,JCarr). Summerland, 19.IX.1957 (7,UBC). Vernon, 27.VII.1926 (1,UBC). Williams Lake, n. end; 05.VI.1958 (1,UASM).

COLORADO:

Montrose, 21.VII.1970 (1,JCarr).

IDAHO:

Geneva, 11.VIII.1966 (2,JCarr). Muldoun, 14.VII.1968 (2,JCarr). Pettit Lake, 13.VII.1960 (3,JCarr); 12.VII.1968 (1,JCarr).

MONTANA:

Immigrant, 03.VIII.1966 (4,JCarr).

YUKON:

Mayo, 03.VII.1955 (1,JBel).

UTAH:

Beaver City, 20.VIII.1966 (2,JCarr). Hatch, 15.VIII.1966 (1,JCarr). Marysvale, 13.VII.1966 (1,JCarr). Monticallo, 25.VII.1970 (1,JCarr). Panguitch, 17.VI.1961 (23,UBC). Red Canyon, 13.VIII.1966 (1,JCarr). Zion National Park, 07.VII.1920 (1,UBC).

WASHINGTON:

Eltopia, 40mi.n. 29.V.1957 (1,WSUP). Lind, 15.V.1922 (1,UBC). Perry, 14.IV.1927 (1,UBC). Ritzville, 29.VII.1922 (1,UBC).

WYOMING:

Atlantic City, 07.VII.1970 (1,JCarr).

3.24.6 Hippodamia falcigera Crotch

ALBERTA:

Calgary, 20.VI.1968 (2,JCarr). Edmonton, 13.IX.1919 (3,UASM); 22.IV.1918 (1,UASM). Fort McMurray, 06.VI.1955 (4,CNC). Ghost Dam, (05.VI.1965 (1,JCarr). Jumpingpound Creek, 15.X.1961 (1,JCarr). Lesser Slave Lake, e. end; 03.IX.1957 (1,UASM). Slave Lake, 4mi. n; beach drift-Lesser Slave Lake; 07.VI.1975 (1,JBel). Tp. 28, Rge. 5, W5 Mer., 22.X.1961 (2,JCarr). Tp. 29, Rge. 5, W5 Mer., 15.VIII.1962 (10,JCarr). Tp. 38, Rge. 6, W5 Mer., 16.IX.1972 (1,JCarr). Wabamun L., nr. Seeba beach, 17.V.1964 (1,UASM). Waterton, /washup/ 21.VII.1931 (1,UASM).

BRITISH COLUMBIA:

Summerland, 21.IX.1932 (1,CNC). Summit Lake, AH mi. 392; 31.VII.1959 (1,CNC).

NORTHWEST TERRITORIES:

Aklavik, 16.VI.1956 (1,CNC). Fort Simpson, 24.VII.1950 (6,CNC). Fort Smith, 31.V.1950 (11,CNC).

YUKON:

Alaska Hwy. 1034, near Kloo Lake; 05.VII.1968 (1,CNC). Gravel Lake, 58mi. e. Dawson; 13.VIII.1962 (32,CNC). Otter Lake, 62° 30'N, 130° 25'W; 28.VII.1960 (2,CNC). Stewart River, (1,CNC).

3.24.7 *Hippodamia glacialis* (Fabricius)

ALBERTA:

Medicine Hat, 19.VIII.1925 (1,UASM); 10.VIII.1928 (1,UASM); 19.VIII.1931 (1,UASM).

3.24.8 *Hippodamia moesta* LeConte

ALBERTA:

Bragg Creek, 11.VII.1959 (1,JCarr). Maycroft, 14.VII.1948 (1,NFRC). Pincher Creek, 25.V.1928 (2,UASM). Waterton, 22.VI.1931 (1,UASM).

BRITISH COLUMBIA:

Bridesville, 03.VIII.1970 (10,CDAS). Chee Kye, 24.VII.1929 (1,UBC). Courtenay, Vancouver Is., 02.VI.1932 (1,UASM). Creston, 26.VIII.1948 (1,UBC). Duck Creek, nr. Wynndel; 13.VI.1960 (9,UASM). Gold Stream, 13.IX.1903 (1,UBC). Lillooet (7,CNC). Merritt, 08.VIII.1948 (1,CNC). Moble Lake, 24.VIII.1920 (1,NFRC). Port Hammond, (1,CNC). Quesnel, 18.VI.1949 (1,UBC). Radium, 06.VI.1953 (1,JCarr). Sanca, 09.VIII.1933 (1,UBC). Wynndel, 19.V.1946 (1,UBC).

MANITOBA:

Atikameg Lake, 31.V.1963 (4,JBel).

MONTANA:

Glacier Nat. Park, Logan Pass; 22.VIII.1973 (2,JBel).

SASKATCHEWAN:

Canwood, 10.VIII.1959 on *Populus balsamifera* (1,JBel).

3.24.9 *Hippodamia oregonensis* Crotch

ALBERTA:

Bald Hills, Jasper National Park; 52°43'N 117°41'W; VI.VII. 1970 (many, JBel.) Banff, Sunshine Ski Lodge; 26.VII.1957 (2,NFRC). Grave Flats, ca. 14.6mi. e. Mountain Park /2060 m, alpine zone/ 22.IX.1974 (10,UASM). Highwood Pass, 50mi. s. Seebe; 28.VI.1956 /7,237 ft/ (1,NFRC). Pocaterra Creek, 01.VII.1959 (3,JCarr). Tp. 35, Rge. 18, W5 Mer., 19.VII.1973 (2,JCarr). Waterton, 08.VIII.1932 (1,UASM).

BRITISH COLUMBIA:

Manning Provincial Park, 03.X.1959 (3,UBC); Mt. Blackwall /6,000ft/ 27.VIII.1961 (6,UBC). Mount Baldy, 03.VI.1970 (3,CDAS). Mount Beaconsfield, 02.VI.1970 (1,CDAS). Mount Ben Lamond, 07.VIII.1960 (1,UBC). Mount Revelstoke, 11.VII.1931 (1,NFRC). Sheep Rock, 8 212 ft., 27.VII.1969 (10,UBC).

MONTANA:

Glacier National Park, Logan Pass /6 660 ft/, pupae on rocks, 22.VIII.1973 (8,JBel).

3.24.10 Hippodamia parenthesis (Say)

ALBERTA:

Bassano Dam, 10.VI.1970 (1,JBel). Beaverlodge, 06.VI.1956 (2,UASM). Brooks, 29.IX.1970 (8,CDAL). Calgary, 09.VII.1953 (3,JCarr). Calling Lake, 22.VI.1964 (21,UASM). Drumheller, 21.VI.1954 (1,JCarr). Duchess, 19.VI.1970 (19,CDAL). Edmonton, V.-IX. (many, JBel, UASM). Ellerslie, 10.V.1970 (1,JBel). George Lake, 20.X.1969 (1,JBel); 01.VII.1973 (many, JBel). Ghost Dam, 16.VIII.1953 (2,JCarr). Gorge Creek, 15.VII.1958 (2,UASM). Gull Lake, 04.VI.1929 (3,UASM). Kananaskis, 21.VIII.1955 (1,JCarr). Leduc, 16.V.1914 (1,UASM). Lesser Slave Lake, e. end; 03.IX.1957 (5,UASM). Lethbridge, 26.VI.1957 (20,UASM). Lundbreck, 11.III.1930 (1,UASM). Medicine Hat, 16.V.1955 (2,JCarr). Milk River, 04.VII.1951 (1,UASM). Ministick Lake, nr. Edmonton; 03.VI.1956 (1,UASM). Pincher, 10.VII. 1973 (8,JCarr). Slave Lake, 4mi. n; beach drift- Lesser Slave Lake; 07.VI.1975 (many,JBel). Tilley, 06.VIII.1955 (1,JCarr). Tofield, 22.V.1923 (2,UASM). Wabamun Lake, 03.IX.1955 (5,UASM). Waiparous, 12.VII.1953 (2,JCarr). Waterton, 10.VIII.1932 (2,UASM).

BRITISH COLUMBIA:

Courtenay, Vancouver Is., 03.V.1932 (4,JBel). Duncan, 25.VIII.1917 (1,UBC). Kamloops, 15.VIII.1954 (5,UBC). Merritt, 29.VIII.1962 (2,UBC). Meyer's Flat, nr. Oliver; 02.V.1957 (2,CDAS). Penticton, 11.VIII.1970 (1,CDAS). Westwick Lake, Cariboo; 01.VIII.1959 (1,UBC).

INDIANA:

Bloomington, Monroe Co., 15.V.1951 (6,JBel); 27.V.1938 (2,JBel).

IOWA:

Ames, 05.VIII.1937 (1,WSUP).

NORTHWEST TERRITORIES:

Yellowknife, 12.VII.1972 (2,JBel).

SASKATCHEWAN:

Kandahar, 05.VII.1968 (1,PMRS). Regina, X. 1964 (1,PMRS). Winter, 12.VI.1970 (1,PMRS).

YUKON:

Rampart House, 23.VI.1956 (1,CNC). Snagg, 14.VII.1966 (1,CNC).

3.24.11 Hippodamia lunatomaculata Motschulsky

BRITISH COLUMBIA:

Vancouver Island; Victoria, V.-X. (many, UBC, CNC).

3.24.12 Hippodamia quinquesignata (Kirby)

ALBERTA:

Bassano Dam, 10.VI.1970 (22,JBel). Beaver Mines area, 16mi. w. Pincher Creek; "aggregation under Juniperus ca. 3,000 individuals" 16.IX.1975 (100,CDAL). Bragg Creek, 02.VII.1971 (1,JBel). Brooks, 29.IX.1971 (10,CDAL). Duchess, 19.VI.1970 (4,CDAL). Edmonton, 26.VII.1915 (2,UASM). Gorge Creek, 26.VI.1958 (1,UASM). Lethbridge, 24.V.1928 (2,UASM). Manyberries, 08.VIII.1949 (1,UASM). Porcupine Hills, 01.X.1970 (4,SDAL). Porcupine Hills, 20mi. w. Claresholm; 'aggregation under rock' 16.IX.1975 (100,CDAL). Vauxhall, 21.VII.1970 (3,CDAL). Waterton, 10.VII.1930 (4,UASM).

BRITISH COLUMBIA:

Meyer's Flat, nr. Oliver; 02.V.1957 (19,CDAS). Okanagan Centre, 19.IV.1957 (20,CDAS). Summerland, 23.IX.1955

(12,CDAS).

NORTHWEST TERRITORIES:

Norman Wells, 23.VII.1954 (1,CNC). Yellowknife, 16.VIII.1973 (1,JBel).

YUKON:

Rampart House, 03.VII.1956 (1,CNC).

3.24.13 Hippodamia sinuata Mulsant

ALBERTA:

Bassano Dam, 10.VI.1970 (3,JBel). Beaver Lake Hills, V. 1973 (2,JBel). Brooks, 19.VI.1970 'alfalfa' (4,CDAL). Calgary, 07.V.1951 (1,JCarr). Castor, 20.IX.19?? (1,UASM). Cypress Hills, 01.VI.1925 (2,UASM). Edmonton, 04.VIII.1919 (1,UASM); 05.VIII.1919 (1,USAM); 08.VIII.1919 (1,UASM). Elkwater, 15.VI.1955 (3,UASM). Fort Chipewyan, 13.VI.1970 (1,JBel). Gorge Creek, 21.VII.1958 (1,UASM). Lethbridge, 20.V.1957 (1,UASM); 18.VII.1944 (1,UASM). Medicine Hat, 27.III.1923 (1,JBel); 02..X.1931 (1,UASM). Tofield, 23.V.1923 (1,UASM). Waterton, 10.VII.1930 (1,UASM).

BRITISH COLUMBIA:

Bridesville, 01.VIII.1970 (1,JBel). Chilcotin, 05.VIII.1930 (1,UBC). Creston, 19.VIII.1947 (2,UBC). Duck Creek, nr. Wynndel; 18.VII.1955 (2,UASM). Lac du Bois, nr. Kamloops; 16.VI.1954 (2,UBC). Ladner, 20.IX.1962 (4,UBC). Midday Creek, 11.VIII.1920 (5,UBC). Nicola, 13.VII.1932 (7,UBC). Quadra Island, 17.VII.1961 (1,UBC). Saanich District, 03.X.1917 (2,UBC). Salmon Arms, 25.IV.1929

(2,UBC). Snake Island, 24.V.1925 (1,UBC). Summerland, 01.VI.1953 (1,JBel). Vancouver, IX.- (many,UBC). Vancouver Island, John Dean Park; 29.X.1972 (60,JBel). Victoria, 18.V.1917 (2,UBC); 26.VI.1929 (1,UBC).

IDAHO:

Parma, 13.VIII.1928 (1,UASM).

NORTHWEST TERRITORIES:

Kakisa River, 21.VI.1973 (1,JBel).

SASKATCHEWAN:

Fort Qu'Appelle, 28.VII.1966 (2,PMRS). Greenbush, 17.VI.1975 (1,PMRS). Punnichy, 21.IX.1962 (1,PMRS).

WASHINGTON:

Pullman, 20.VI.1956 (1,WSUP); 01.XI.1948 (1,WSUP); 25.IV.1966 (1,WSUP). Smoot Hill, 8mi. nw. Pullman, 15.IX.1972 (4,WSUP). Tacoma, 20.VI.1960 (1,Bel). Mount Vernon, 07.V.1957 (1,JBel). O'Sullivan Dam, Grant Co., 27.VI.1954 (1,WSUP).

3.24.14 Hippodamia tredecimpunctata (L.)

ALASKA:

many localities (USNM).

ALBERTA:

Bashaw, 02.VI.1957 (1,UASM). Beaver Lake Hills, V.1973 (12,UASM). Brooks, 29.IX.1970 (14,CDAL). Calgary, V.-IX. (many, UASM, JBel, JCarr). Cypress Hills, 18.VII.1956 (8,UASM). Duchess, 19.VI.1970 (5,CDAL). Edmonton, V.-X. (many, UASM, JBel). Ellerslie, 10.V.1970 (25,JBel).

Elkwater, 15.VI.1955 (2,UASM).25.VI.1951 (1,NFRC). Fort Chipewyan, 13.VI.1970 (5,JBel). Gleichen, 06.VII.1955 (2,JCarr). Gorge Creek, 22.VII.1958 (9,UASM). Grande Prairie, 14.VII.1955 (1,JCarr); 13.VI.1972 (2,JBel). Gull Lake, 23.VI.1929 (2,UASM). Kananaskis, 08.V.1971 (7,UCKC). Leduc, 14.V.1914 (1,UASM). Leyland, 14.VII.1949 (1,NFRC). Medicine Hat, V.-X. (many, UASM). Ministik Lake, 03.VI.1956 (17,UASM). Valleyview, 48mi. sw., 07.VIII.1964 (1,NFRC). Wabamun, 31.VII.1924 (1,UASM).

BRITISH COLUMBIA:

Courtenay, 03.V.1932 (1,UASM). Huntingdon, 26.IV.1924 (3,UASM). Osoyoos, (1,UASM). Quilchena, 29.VI.1962 (10,UBC). Radium, 06.VI.1953 (3,JCarr). Summerland, 06.VII.1950 (3,CDAS). Vancouver, V.-IX. (many, UBC).

IOWA:

Ames, 18.VIII.1933 (1,WSUP).

WASHINGTON:

Irrigation Experimental Station, Rosa Unit, Benton Co., 08.VIII.1925 (1,WSUP). O'Sullivan Dam, Grant Co., 25.IX.1954 (1,WSUP). Pullman, 10.V.1950 (1,WSUP); 10.V.1960 (1,WSUP).

3.24.15 Hippodamia washingtoni Timberlake

BRITISH COLUMBIA:

Anyox, 27.I.1931 (1,UBC).

3.24.16 Hippodamia ulkei (Crotch)

ALASKA:

Cape Thomson, 6.7mi. se; 07.VII.1961 (1,CNC). Deering, 19.VII.1968 (1,JBel). Ogotoruk Creek, 07.VII.1960 (1,CNC). Umiat, 21.VII.1959 (2,CNC).

ALBERTA:

Grave Flats, ca. 14.6mi. e. Mountain Park; 22.IX.1974 /2060 m, alpine zone/ (1,JBel).

BRITISH COLUMBIA:

Summit Lake, AH mi. 392; 15.VI.1959 (2,CNC).

NORTHWEST TERRITORIES:

Anderson River, delta; 13.VI.1962 (9,UASM). Anderson cabin, 27-29.VI.1974 (1,UASM). Atkinson Point, 69° 57'N, 131° 30'W; 20.VII.1972 (5,UASM). Coppermine, 12.VII.1951 (1,CNC). Fort McPherson, (1,CNC). Muskox Lake, 64° 54'N, 108° 10'W; (1,CNC). Richard Island, MacKenzie delta; (1,CAS). Tanunuk, 10.VIII.1930 (1,UASM). Tuktoyaktuk, 20mi. e., 25.VI.1971 (3,CNC). Wood Bay, Nicholson Is., 06.VII.1974 (1,UASM).

YUKON:

Rampart House, (1,CNC). Reindeer Depot, 23.VI.1948 (3,CNC).

3.25.1 Macronaemia episcopalis (Kirby)

ALASKA:

College, 31.V.1966 (1,JBel).

ALBERTA:

Barrhead, 20mi. e., 30.VII.1965 (2,NFRC). Calgary, 18.VI.1956 (3,JCarr). Calling Lake, float plane base; - 8.VI.1969 (1,UASM). Cypress Hills, 25.VI.1927 (1,UASM). Edmonton, 02.VI.1917 (1,UASM). Elkwater, 15.VI.1955 (1,UASM). Fort McMurray, 12.VI.1953 (10,CNC). Gleichen, 06.VIII.1955 (1,JCarr). Medicine Hat, 21.VI.1928 (1,UASM). Milk River, 49° 08'N, 110° 48'W; 05.VI.1955 (5,CNC). St. Albert, 12.VII.1924 (1,UASM). Slave Lake, 4mi. n; beach drift- Lesser Slave Lake; 07.VI.1975 (1,JBel). Stettler, 19.V.1956 (4,JCarr). Tilley, 09.IX.1956 (1,JCarr). Tofield, 22.V.1923 (1,UASM). Tp. 3, Rge. 10, W5 Mer., 01.VII.1972 (1,JCarr). Tp. 3, Rge. 1, W5 Mer., 25.III.1973 (1,JCarr). Tp. 38, Rge. 6, W5 Mer., 16.IX.1972 (1,JCarr). Twin Butte, 10.VI.1962 (5,CNC). Wabamun, 13.V.1924 (1,CNC). Waiparous, 28.VI.1957 (3,JCarr).

BRITISH COLUMBIA:

Creston, 01.X.1933 (3,UBC). Copper Mountain, 13.X.1930 (1,UBC). Fort St. John, 10.VI.1959 (3,UBC). Oliver, 12.VII.1945 (1,CNC). Osoyoos, 22.V.1959 (1,CNC). Quesnel, 03.VII.1949 (3,UBC). Pavilion, 09.VII.1969 (1,JCarr). Penticton, 18.VII.1923 (1,UBC). Philloo Lake, 06.VI.1960 (1,UBC). Richter Pass, 15.VII.1955 (1,CNC). Summerland, Fish Lake; 25.IX.1931 (10,CNC).

NORTHWEST TERRITORIES:

Fort Smith, 21.VI.1950 (2,CNC).

SASKATCHEWAN:

Regina, 13.IV.1967 (1,PMRS). Tulabi Lake, 02.VII.1970 (1,PMRS).

YUKON:

Gravel Lake, 58mi. e., Dawson; 12.VIII.1962 (8,CNC). Mayo, 09.VII.1955 (1,JBel). Reindeer Depot, /no other data/; (1,CNC).

3.26.1 *Mulsantina picta* (Randall)

ALBERTA:

Banff, 16.VIII.1927 (1,UASM). Crow's Nest Pass, 18.VII.1970 (1,UASM). Exshaw, 27.VI.1954 (1,JCarr). Hussar, 05.VI.1960 (1,JCarr). Kananaskis, 9-13.VI.1969 (2,UCKC). Medicine Hat, 12.VI.1926 (1,UASM). Robb, 40mi. w., 10.VI.1971 (5,JBel). Waiparous, 10.VII.1957 (2,JCarr).

BRITISH COLUMBIA:

Chilcotin, 29.VI.1930 (1,UBC). Copper Mountain, 13.X.1929 (2,UBC). Creston, 16.II.1947 (1,UBC). Gallagher Lake, 4mi. n. Oliver; 19.IX.1957 (1,UBC). Golden, 10.VII.1929 (1,UASM). Kamloops, 06.VI.1937 (1,UBC). Kootenay Landing, 11.V.1950 (2,UBC). Langley, 30.VII.1957 (1,UBC). Merritt, 06.V.1923 (1,UBC). Mill Bay, Vancouver Is., 29.VII.1957 (1,UBC). Okanagan Falls, 07.VI.1956 (1,UBC). Okanagan Lake, 05.VIII.1956 (1,JCarr). Pavilion, 30.VI.1961 (1,UBC). Penticton, 23.IX.1927 (1,UBC). Quesnel, 26.VI.1949 (1,UBC). Summerland, 08.VIII.1957 (1,UBC). Vernon, 01.V.1924 (2,UBC). Wycliffe, 13.VII.1962 (1,JCarr).

SASKATCHEWAN:

Cypress Hills, 07.IX.1967 (3,PMRS).

3.26.2 *Mulsantina hudsonica* (Casey)

ALBERTA:

Calgary, 02.VI.1968 (2,JCarr). Cold Lake, 04.VIII.1949 (2,NFRC). Collinton, 26.VII.1949 (1,NFRC). Cypress Hills, 30.VII.1969 (1,UASM). Edmonton, 18.V.1916 (3,UASM). Fort Kent, 30.V.1950 (1,NFRC). Fort Smith, 05.VI.1951 (1,NFRC). Ghost Dam, 13.VI.1973 (2.JCarr). Gull Lake, 04.VI.1929 (1,UASM). Elkwater, 12.IX.1968 (12,NFRC). Jasper Nat. Park, Celestine Lake Rd., 29.VIII.1956 (3,NFRC). Miette Hot Springs, 17.IX.1937 (1,UASM). Red Rock, 28.VIII.1950 (1,NFRC). Rocky Mt. House, 02.VI.1965 (1,NFRC). Slave Lake, 4mi. n; beach drift- Lesser Slave Lake; 07.VI.1975 (1,JBel). Tp. 25, Rge. 3, W5 Mer., 02.V.1973 (1,JCarr). Wabamun, 13.V.1933 (1,UASM).

BRITISH COLUMBIA:

McBride, 10.VI.1937 (22,UBC). Muskwa, 21.VIII.1952 (1,UBC).

NORTHWEST TERRITORIES:

Fort Providence, 30mi. sw., 14.VIII.1967 (1,NFRC). Hay River, 08.VI.1956 (3,NFRC).

SASKATCHEWAN:

Cypress Hills, 07.IX.1967 (1,PMRS). Porcupine Plain, 18.VIII.1967 (1,PMRS). Red Earth, 19.VIII.1967 (1,PMRS).

YUKON:

Mayo, 05.VII.1955 (1,JCarr).

3.27.1 *Anisosticta bitriangularis* (Say)

ALASKA:

Deadman Lake, AH 1249; 06.VII.1968 (5,CNC).

ALBERTA:

Banff, 07.VII.1922 (5,CNC). Barrhead, 20mi. e., 30.VII.1965 (1,NFBC). Calahoo, 24.V.1968 (1,UASM). Cypress Hills, 25.V.1925 (2,UASM). Drayton Valley, 28.VII.1969 (1,JCarr). Edmonton, 08.V.1915 (1,UASM); 13.V.1934 (1,UASM); 17.VIII.1916 (1,UASM). Fort McMurray, 10.VI.1953 (10,CNC). Gull Lake, 08.VI.1929. (2,UASM). Lac LaBiche, 31.V.1959 (1,UASM). Leduc, 06.V.1914 (1,UASM). Ministik Lake, 08.VI.1959 (1,UASM). Slave Lake, 4mi. n; beach drift-Lesser Slave Lake; 07.VI.1975 (3,JBel). Stettler, 19.V.1956 (9,JCarr). Tp. 37, Rge. 6, W5 Mer., 16.IX.1972 (4,JCarr). Tp. 38, Rge. 6, W5 Mer., 16.IX.1972 (1,JCarr). Valleyview, 28.VII.1969 (2,JCarr). Wabamun, 02.VIII.1929 (1,UASM). Waterton, 02.VI.1931 (1,UASM); 10.VII.1930 (1,UASM).

BRITISH COLUMBIA:

Atbara, 21.IX.1947 (1,UBC). Creston, V.-IX.1931 (14,UBC). Copper Mountain, 14.VI.1930 (1,UBC). Hope, 12mi. e., 02.VI.1968 (22,CNC). Nahun, 08.VIII.1970 (1,CDAS). Quesnel, 03.VII.1949 (2,UBC). Rogers Pass, 10mi. e., 17.VI.1968 (1,CNC). Royal Oak, Vancouver I., 06.V.1954 (1,UBC). Salmon Arms, 19.V.1929 (6,UBC). Springhouse, 04.VI.1962 (2,UBC). Vanderhoof, 15.VI.1962 (1,UBC). Victoria, 09.VI.1962 (1,JCarr).

SASKATCHEWAN:

Fort Qu'Appelle, 28.V.1968 (1,PMRS). Red Earth, VIII.1967 (2,PMRS).

YUKON:

Mayo, 09.VII.1955 (2,JCarr).

3.27.2 Anisosticta borealis Timberlake

ALASKA:

Hope, Kenai Peninsula; 15.VII.1951 (16,CNC). Nome, 10.VII.1951 (1,CNC). Nome, 4mi. e., 12.VIII.1955 (5,UASM). Umiat, 20.VII.1959 (3,CNC). Unalakleet, 17.VI.1961 (13,CNC).

MANITOBA:

Farnworth nr. Churchill, 26.VI.1952 (2,CNC). Churchill, 10.VIII.1937 (6,CNC).

NORTHWEST TERRITORIES:

Aklavik, 29.VI.1956 (34,CNC); 04.VII.1931 (6,UASM). Reindeer Depot, 06.VIII.1948 (14,CNC).

SASKATCHEWAN:

Petterson Lake, ne. corner, 24.VI.1975 (1,PMRS).

YUKON:

North Fork Crossing, mi. 43; 03.VII.1962 (1,CNC). North Fork Pass, Ogilvie Mts., 19.VI.1962 (1,CNC). Mirror Creek, AH mi. 1209; 28.VI.1958 (1,CNC). Otter Lake, 62° 30'N, 130° 25'W; 16.VII.1960 (6,CNC). Rampart House, 24.V.1951 (3,CNC).

3.28.1 Psyllobora vigintimaculata (Say)

ALBERTA:

Beaver Creek, 22.VI.1926 (1,UASM). Edmonton, 08.VI.1916 (3,UASM); 09.VII.1916 (2,UASM). George Lake, 16.V.1955 (1,UASM); 01.VII.1973 (many,JBel). Gull Lake, 08.VI.1929 (1,UASM). Lac La Biche, 06.VII.1944 (1,NFRC). Medicine Hat, 28.VIII.1921 (1,UASM); 14.VII.1926 (1,UASM); 01.VI.1963 (1,JCarr); 03.VI.1923 (1,UASM). Pocahontas, JNP; 28.VI.1972 (20,JBel). Red Deer, 05.VII.1959 (3,JCarr). Slave Lake, 4mi. n; beach drift- Lesser Slave Lake; 07.VI.1975 (5,JBel). Spruce Lake, 01.VI.1950 (1,NFRC). Tp. 37, Rge. 6, W5 Mer., 16.IX.1972 (1,JCarr). Wabamun, 02.VII.1917 (1,UASM). Waiparous, 30.VI.1960 (1,JCarr). Warspite, 19.VII.1967 (15,NFRC).

BRITISH COLUMBIA:

Copper Mountain, 02.IX.1930 (1,UBC). Creston, 08.VI.1937 (1,UBC). Denman Island, 18.VII.1961 (1,UBC). Duncan, 17.VIII.1927 (2,UBC). Fort Langley, 27.V.1924 (1,UBC). Fort Nelson, 18.VII.1949 (1,UBC). Gallagher Lake, 4mi. n. Oliver; 19.VX.1957 (1,UBC). Golden, 10.VII.1929 (2,UASM). Goldstream, 26.VIII.1923 (1,UBC). Hope, 19.VI.1955 (1,UBC). Kamloops, 25.V.1933 (2,UBC). Kitwanga River, 13.V.19.1957 (1,UBC). Lytton, 19.VII.1931 (2,UBC). Mandarte Island, 31.VII.1960 (1,UBC). Nanaimo, 09.VI.1952 (14,UBC). Okanagan Lake, 19.IX.1957 (12,UBC). Radium, 06.VI.1953 (2,JCarr). Royal Oak, 28.IX.1917 (3,UBC). Saanich District, 20.IV.1960 (1,UBC). Skimiken Valley, 24.VIII.1932 (1,UBC). Soda Creek, 03.IX.1950 (8,UBC). Summerland, 28.V.1952 (12,CDAS). Terrace, VIII.1924

(1,UBC). Tsawwassen Beach, 21.VII.1962 (1,UBC). Van, 12.X.1928 (2,UBC). Vancouver, 24.IX.1949 (25,UBC); V.-X. (many, UBC). Vernon, 18.VI.1927 (5,UBC). Victoria, 20.V.1916 (2,UBC). Winslow, 23.VIII.1925 (1,UBC).

SASKATCHEWAN:

Cypress Hills, 08.IX.1957 (1,PMRS). Fort Qu'Appelle, 30.VI.1966 (1,PMRS). Katepwa, 29.VIII.1966 "on _Populus tremuloides_" (1,NFRC). Red Earth, VIII.1967 (1,PMRS). Wanless, 12.IX.1967 "on _Betula papyrifera_" (2,NFRC). Whiteshell, 19.VIII.1963 "on _Betula papyrifera_" (1,NFRC). Wymark, 25.VII.1967 "on _Pinus_ sp.," (1,NFRC).

3.31.2 _Psyllobora borealis_ Casey

BRITISH COLUMBIA:

Creston, V.-VIII.1949 (13,UBC). Duncan, 19.VI.1928 (14,UBC). Haney, 02.VII.1962 (1,JCarr). Okanagan Lake, 19.IX.1957 (12,CDAS); 08.VIII.1956 (1,JCarr). Penticton, 09.IX.1931 (2,UBC). Qualicum, 16.IX.1961 (2,JCarr). Radium, 06.VI.1958 (1,JCarr). Sanca, 24.V.1933 (1,UBC). Skimiken Valley, 24.VIII.1932 (2,UBC). Soda Creek, 03.IX.1950 (1,UBC). Vancouver, 15.V.1956 (1,UBC).